

CHEMICAL & METALLURGICAL ENGINEERING

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S. D. KIRKPATRICK, *Editor*

AUGUST, 1937

Science vs. Politics

WHEN THE PUBLICITY representatives of the National Resources Committee prepared their newspaper releases on "Technological Trends and National Policy", we are reliably informed that they regarded the issuance of the report as merely a routine matter. To them it did not differ materially from the other academic reports of various sub-committees. Yet Sunday editions carried page after page of its text. Cartoonists found pleasure in resurrecting their robots to show Science putting men out of work. Even the columnists, most notably Hi Phillips of the *New York Sun*, began talking of a new federal Bureau of Coming Events and the appointment of a Secretary of Cellophane to sit in the cabinet and predict the social implications of unborn inventions. Why all this interest? What, if any, serious meaning does it have for those of us whose lives are linked with scientific and technological pursuits?

It has been almost five years since Technocracy found itself in the national limelight. Yet the same avid interest that made possible its tremendous but short-lived popularity is apparently still alive in the minds of many people. They feel that Science may have been in some way responsible for the depression, but they would like to believe that it offers the most promise for their future progress. They see the immediate effects of technological unemployment, but fervently hope that Science will open up still greater opportunities in industries as yet unborn. They grope for the facts and figures that will answer the agitator and at the same time crystallize their own ideas about this all-pervading problem.

So a report like this, coming from a distinguished group of impartial scientists and engineers, has a deep appeal. It stimulates all kinds of thinking and discus-

sion. "At last," say the critics of Science, "the government is going to do something about this great force of man-made destruction." "At last," say the friends of Science, "here is high recognition of constructive work and a practical means for guiding scientific achievement in the public interest." To the extent that such reports as this attract public attention and serious study, they are doubtless worthwhile. But to the extent that they link Science to Politics in a broad program of national planning, they hold forth empty promises, just as dangerous and as futile as the false premises of Technocracy.

What reason have we to believe that the government in Washington can set up a great over-all planning board with sufficient knowledge, vision and honesty to predict the developments of science and to control them in the public interest? Who is to tell us what we shall need in the future, and just how and when it will be provided for us? Who is to say that our patent system must be changed and individual invention and enterprise controlled to meet the changing conditions of planned economy? In this country the eventual answer to all of these questions would be found in just one word—Politics!

Therefore we hope that national planning of science and technology, in any sense of political or economic control, is one of the things this country can avoid during the years to come. Recent developments in Washington have proved that opposition can be effective only when backed by well-informed public opinion. That, then, should be our cue for the future—to continue to tell the true story of scientific accomplishments under our system of free enterprise and individual initiative. The public is keenly interested in Science; it is time that Science should be interested in the public.

From an EDITORIAL VIEWPOINT

LABOR'S OBJECTIVE UNCHANGED

DECEPTIVE QUIET on the labor battle front has led many to believe that the strength of C.I.O. is weakening, and that a real controversy exists between Lewis and Roosevelt. Chemical industry is not widely affected, but it has enough interest in this situation to study the under-surface currents in order that it may avoid needless difficulty later.

The major objective of labor leaders today is not to secure higher wages, shorter hours, or better working conditions. Those are all definitely minor objectives *at this time*. The principal effort at present is to secure union recognition. And there is no weakening of the drive toward that immediate goal.

Chemical executives can point with pride to the high standards of wages and the reasonable hours of work maintained in their lines of business. But meritorious achievement of this sort is not enough. The union question is still to be faced. That question has the backing of both C.I.O. and the A.F. of L., even when the two groups are trying simultaneously and competitively to gain control in a single plant. And the New Deal organization, calling this objective "collective bargaining," is back of the same movement. No one should be misled by the very real, but over-conspicuous, differences between the reform and labor groups. They are important, but not sufficient to minimize the unionization demands.

FARM POLITICS AGAIN MILITANT

TO COMPEL the use of corn for alcohol manufacture is a perennial effort of corn-belt members of Congress. This summer that group of self-appointed spokesmen for the farmers are beating the tomtoms and shouting their war cry for two prospective pillages. Every producer and user of industrial alcohol should be concerned.

First, the proposed tax of 3 cents a gallon on molasses, contemplated as a part of the sugar regulatory bill in Congress, is an indirect tariff on molasses used in competition with corn for the fermentation industries. Without the votes of those Congressmen interested in corn the sugar tax legislation cannot pass. Despite the fact that this bill would hurt corn, rather than help it, the mid-western representatives seem fairly aligned for this molasses-mortuary measure.

Second, and in connection with the food and drug legislation, the old scarecrow of "grain" alcohol only for beverages has again been paraded

in the halls of Congress. This item, much less certain than the molasses tax, is merely another corn-protection measure of farm politics.

Chemical engineers know the real meaning of these two proposals. They represent a threat against alcohol for industrial usage, and an artificial boost for alcohol's competitors. Both measures are based on fallacious assumptions. Neither would benefit the corn farmers now or later. Either one is likely to destroy forever a section of the market for alcohol, thus hurting corn to just that extent.

Users as well as producers of alcohol can well bring these facts to the attention of those who will have to vote next year, if not this, on these two bills. They are quite as bad for the corn belt as they are for the chemical industry. Congressmen should learn this.

GAINS ON THE SILICOSIS FRONT

IN THE TWO YEARS that have passed since we last expressed ourselves editorially on silicosis, progress in the fight against the disease and its consequences has been material. At least in a preliminary way, the extent to which workers of the country are seriously affected has been enumerated and the number, much smaller than alarmists would have us believe, is encouraging. Means for elimination of the hazard in dusty industries have been studied and are available for use, in most cases at reasonable cost. Finally, the legal aspects of the problem are gradually being straightened out and wholesale compensation racketeering, such as has been so much in the news in recent years, has apparently become a thing of the past.

Much of our present knowledge of the disease and its prevention has been ably presented in the summary reports of the National Silicosis Conference, recently issued by the U. S. Department of Labor, and briefed elsewhere in this issue. The important things that come out of the reports are three: That if not curable, silicosis is at least preventable, and by relatively simple means; that except for asbestos dust, silica and silica alone can cause the damage which in the past has also been, by some investigators, credited to silicates; and that an adequate legal status for silicosis compensation should be the immediate aim of every state.

Many states have been lax in passing silicosis legislation, while others have done so without full realization of the requirements. However, it would seem that there is now sufficient accumulated experience to permit both the framing of fair and



adequate laws, and the setting up of suitable insurance plans. A major concern of management in the silica-hazardous industries should be to see that this is promptly done.

FILLING THE EDUCATIONAL GAPS

MOST ENGINEERING graduates seem to agree that four years of college study constitute only a fair beginning in the process of acquiring an education. Inevitably there are gaps in the college undergraduate course which cannot be filled for the simple reason of lack of time. And since formal post-graduate study is available to only a few, most engineers have found it necessary to fill the gaps as best they can after graduation. This is not at all easy because practical educational aids and facilities are notoriously scarce.

To help meet this situation, the Engineers' Council for Professional Development, 29 W. 39th St., New York City, has made available some useful study aids for the young engineer. First, for the man who wishes to continue his formal education there is a list of university extension courses offered throughout the country. For those who wish to lay out their own programs, E.C.P.D. provides a list of recommended cultural books and five technical bibliographies (see p. 445 of this issue) covering each of the various engineering fields. As a consensus of the recommendations of 100 members of the various engineering societies, these lists offer to both junior and older engineers a most valuable study and reference aid.

TOWARD A 40-HOUR WEEK FOR THE WORLD

ALL THE WORLD looks enviously at American achievement in labor benefits. Labor leaders throughout the world are seeking to capitalize on our progress for the benefit of their own groups of workers.

American industry does, and should, desire to assist the rest of the world in advancing the standard of living and providing for better wages and better working conditions. One of the most useful agencies to that end is the International Labor Office, an affiliate of the League of Nations with which the United States has long had a useful and official working relationship. The service of that agency will be clear from an article in the present issue of *Chem. & Met.*

Selfish as well as humanitarian motives will encourage American chemical industry to support the

specific measure on which Dr. Theodore J. Kreps reports in that article. It is not yet evident just how international agreement will work out to support a 40-hour week for chemicals workers the world over. As a matter of fact, such formal agreement is not an essential to progress. The important thing is that the rest of the world gradually improve working conditions and shorten hours, in order that the international competition may be more reasonable and fair. The movement described by Dr. Kreps is an important effort to that end.

The author of this manuscript speaks with real authority. He was the American delegate at the Geneva conferences which he describes. The position which he achieved there is evidenced clearly by the fact that he was chosen by the conference to report its findings at official sessions of the International Labor Office. Dr. Kreps' presentation is, therefore, authoritative and dependable. It is also useful and inspiring to those who believe in sound and sane labor progress the world over.

A MODEL OF INCONSISTENCY

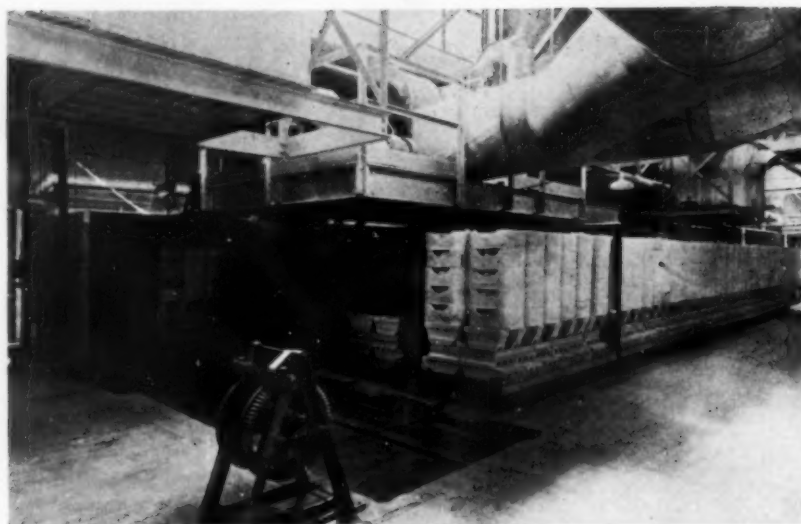
EVER SINCE it was so named by Congress on June 4, 1920, the Chemical Warfare Service has been tagged with the stigma of "warfare" despite the fact that its work has been almost wholly that of chemical service to the entire U. S. Army. After seventeen years this inconsistency of name and function was to have been corrected by Congress in a bill that passed the Senate Feb. 11, 1937, deleting the word "Warfare" from its name. Last month, for reasons of its own, the House Committee on Military Affairs amended the bill by changing the name from Chemical Service to Chemical Corps—thus making it consistent with the Medical Corps and Engineers Corps, both of which are primarily service agencies.

But now comes a model of inconsistency in the form of a vehement veto from our President in which he declares: "To dignify this service by calling it the Chemical Corps is, in my judgment, contrary to a sound public policy." He violently attacks chemical warfare as "inhuman and contrary to what modern civilization should stand for"—yet admits that the work of our C.W.S. is primarily that of chemical service and necessary defensive studies. His veto message gave him a rare opportunity to display humanitarian ideals with which all will agree and which will be roundly applauded by the man in the street—but the inconsistency of name and function continues.

By THEODORE R. OLIVE

ASSOCIATE EDITOR, CHEM. & MET.

Engineering Methods



Show Their Worth in Efficient POTTERY MANUFACTURE

IN TENSE COMPETITION from cheap imported ware is only one of the reasons why a careful engineering approach to production problems is considered essential in the plants of the Onondaga Pottery Co., at Syracuse, N. Y. Even more impelling, it appears, is the urge to manufacture by the most efficient methods largely because such methods *are* most efficient. This explains why so many innovations are found in the company's two plants; why improvements hitherto unknown in tableware potteries have been applied in drying the green ware; why the most modern types of tunnel kilns have recently been completed and put into operation; and why layouts have been planned to "stream-line" production as much as possible.

In the original design of the company's newer plant, the Court St. pottery, the first unit of which was built in 1921, several considerations dictated the type of construction chosen. Straight-line flow of materials in process was the primary requirement, calling for a layout which would permit future expansion to any desired extent without interfering with existing production facilities. These conditions could best be met with a single story plant which, although it would mean greater ground area and additional winter building heating load, would have much better flexibility than multi-story construction, better light and better ventilation.

Dust control is not the least of the potter's worries, particularly since the importance of the silicosis hazard has become known. With a body containing on the average 35 per cent silica, most of which is introduced into the process ground to a fineness of less than 200 mesh, the plant housekeeping and ventilation methods must be carefully chosen. Much thought has been given to dust elimination at both plants of the Onondaga Pottery Co. and exhaust fan and vacuum cleaning equipment are used extensively.

Originally, considerable process steam was required for drying at the Court Plant, but this load has now largely been assumed by the waste heat from a new continuous tunnel kiln. In summer a part of the power required must be purchased, but during the winter the exhaust steam load for building heating is sufficient to permit the byproduct generation of the 650 electrical horsepower used in the plant.

Both coal for the powerhouse and raw materials for the pottery are brought in on a spur of the main freight line of the New York Central Railroad. Two sidings run the entire length of the plant, a distance of over one-fifth of a mile. At the extreme north end, raw materials come in, in box-cars, the clays and feldspar in bulk, and the flint in bags. All materials are sampled and subjected to quality and uniformity tests in the laboratory before being unloaded to stalls in a storage building.

Preparation of batches is the first process step. Normally, a batch consists of about 45 per cent clay, 35 per cent flint, and the balance feldspar plus a little whiting. Three bodies are produced, all of which are translucent in thin sections: A white, an ivory and an "adobe," the latter of a tawny color similar to the adobe dwellings of the Southwest. For each of these a suitable coloring oxide or stain is used as a minute percentage of the batch. The clay requirement is largely met with high-grade English china clays, to which is added just enough ball clay to give proper working properties. The "flint" is a pure quartzite rock ground to more than 95 per cent through 200 mesh, and the feldspars of the potash variety, derived either from Maine or Canada.

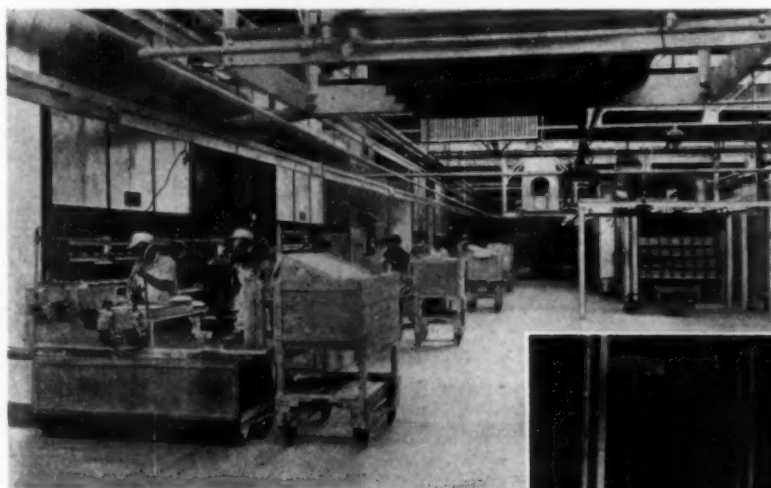
Hand-propelled buggies are used in gathering clay, feldspar and whiting, while the silica is trucked to the batch-mixing department in its original bags. The batch is weighed out on a blind scale and dumped into a two-agitator blunger, placed beneath the floor. For the con-

trol of dust in dumping, a cubicle vented to an exhaust fan is placed over the chute leading to the blunger. In addition, during the dumping of the flint, operators wear filter-type respirators.

In the blungers, which are equipped with stainless steel agitator blades, batches are mixed to a thin slurry with water, then dropped to a holding sump or roughing agitator, from which the slurry is pumped continuously by a plunger pump over a pair of Crossley vibrating screens, or lawns, each of which is supplied with two 120-mesh Monel metal screen decks. The second deck is a safety precaution in case of breakage. Oversize is discarded while the slurry passes through and flows over two Franz Ferro-Filters for magnetic removal of iron particles.

Discharge from the separators drops to a second holding sump or finish agitator. From here it is elevated by a diaphragm pump to a feed tank which in winter can be steam heated for temperature control. Thence, the slurry is drawn into a cylinder evacuated by means of a water jet ejector to 28-in. vacuum, where it is retained a sufficient time for substantially complete de-airing. The system used is that patented and licensed by the Lapp Insulator Co. Among other improvements it has had the remarkable effect of eliminating any need for subsequent aging of the moist clay.

After de-airing, the slurry is withdrawn from the vacuum tank by a four-cylinder reciprocating pump and forced into one of two hydraulically closed recessed-plate filter presses, also of Crossley manufacture, where the clay is retained, while the bulk of the water is discharged to the sewer. Feed pressure for each press is charted by a recording pressure gage, thus enabling the operator to follow the pressing cycle accurately, switching the flow to the second press at a pressure which will just yield the desired moisture, 22.5 per cent, wet basis.



Opposite page: Entrance end of Onondaga's new bisque tunnel kiln; waste heat piping and fans appear above

Left: Jiggers and dryers, with final tunnel dryer at right

Below: Running a load of ware into the walking beam glost kiln

After a press has been cleaned, the moist clay is fed into a Crossley pug mill where it is extruded as a 4-in. diameter bar, ready for the forming operations. A part of the clay, however, which is to be used in slip casting, is taken from the press to a rotating drum where it is made up with water and electrolytes to a heavy but fluid slip. This has to be done with considerable care and the proper pH value maintained within close limits.



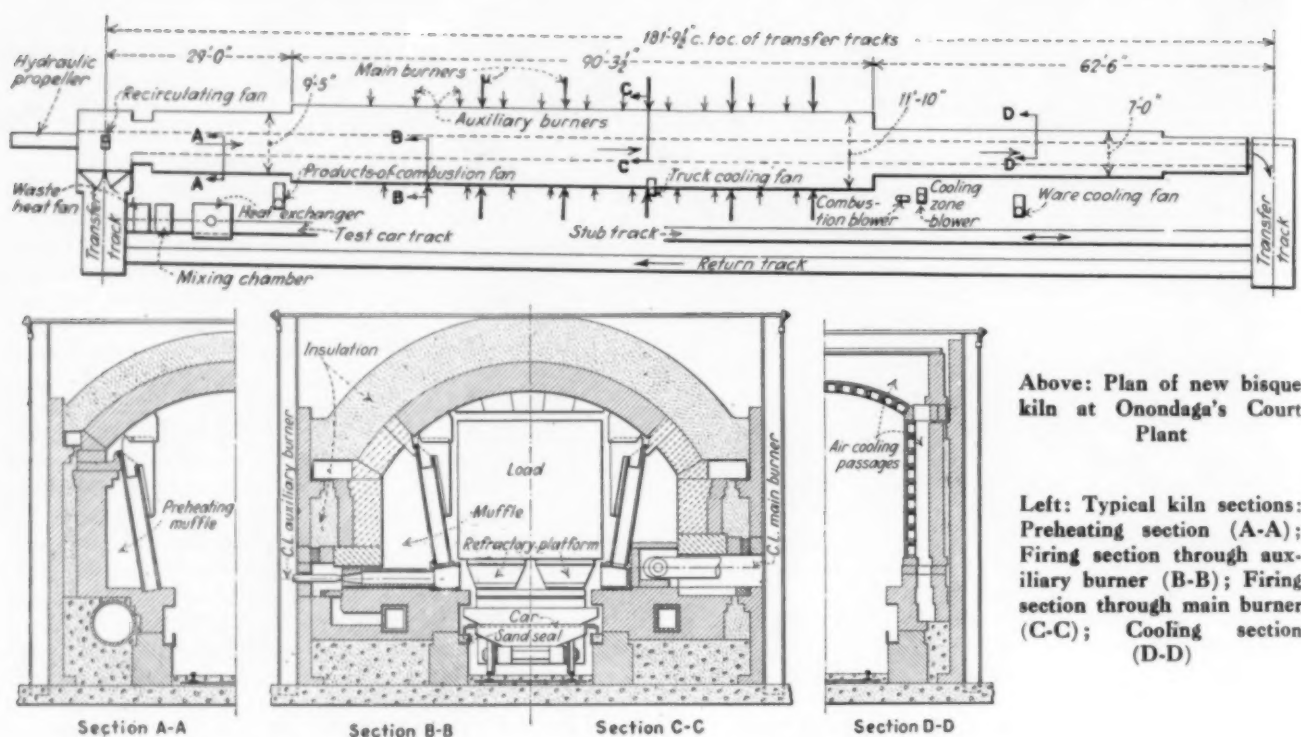
Two methods of forming are employed for tableware. Less complicated shapes such as cups, plates and platters, are produced by jiggering, while for pitchers, jugs, handles and the like, slip casting is required. In both methods, plaster of paris molds are used.

When a particular item is to be produced by jiggering, a chunk of clay is thrown on a potter's wheel into a disk or cup shape roughly resembling the finished article, then formed on a second wheel either over or inside a plaster mold by means of a stationary metal template cut to the desired contour. The jigger operator or maker, who is a highly skilled craftsman, then places the formed ware and its plaster mold in a continuous dryer where the moisture content is reduced to about 12 per cent on the dry basis. A second dryer completes this operation.

Six new dryers used for these operations are among the most interesting pieces of equipment in the plant. All are supplied with air heated by waste heat from the bisque tunnel kiln. Five are preliminary dryers used for the freshly formed ware and the sixth, a 114-ft. tunnel dryer, in which the drying is completed. All are unique in pottery practice in that both waste heat and counterflow of air and ware are employed. The result is much more rapid and efficient drying than is usually encountered in this industry. Owing to the fact that the ware first meets relatively cool air of high humidity, "case-hardening" is avoided and drying strains minimized. This is highly important in pottery manufacture, since the shrinkage in drying is about 2 per cent.

The preliminary dryers, of both Philadelphia Drying Machinery and Proctor & Schwartz construction, all operate under balanced draft, obtained by using induced draft fans at the discharge. Each is driven through a Reeves Vari-Speed pulley which can be adjusted to a speed dependent on the characteristics of the work in process. Hot air is supplied at about 150

deg. F., and discharged with a high moisture content at about 96 deg. F. The ware conveyor is a shelf type which makes



Above: Plan of new bisque kiln at Onondaga's Court Plant

Left: Typical kiln sections: Preheating section (A-A); Firing section through auxiliary burner (B-B); Firing section through main burner (C-C); Cooling section (D-D)

a number of vertical runs with a retention time of 1½ hours, the ware being lifted from the molds at the rear. As the molds return through the dryer, they are subjected to additional drying.

The final tunnel dryer, which is also of the counterflow type, was both designed and built at the Court Plant. The ware conveyor is of the overhead carrier type from which shelves carrying the partly dried ware are suspended. Ware requires 20 hours in passing through. The dryer comprises an entrance and an exit vestibule and four heated zones or compartments, to which the air is supplied in cross circulation. To avoid drying excessively on one side of the ware, the direction of flow is reversed in alternate compartments. Three of the four heated zones are provided with recording wet-and-dry bulb psychrometers, while the fourth has a recording thermometer only. Although humidity control has not yet been found necessary, provision has been made for the admission of steam or spray water if this should later be found necessary.

It has been mentioned that slip casting is used for the production of more intricate shapes than can be made by jiggering. In the casting department the molds are set up on tables with perforated tops built over a plenum chamber, which, when desired, can be supplied with waste hot air for drying. It is contemplated to use waste heat in this manner only at night when the preliminary dryers are not in operation. Clay slip of the proper physical and chemical characteristics is poured into a mold and water immediately begins to penetrate the plaster, forming a clay layer against the mold surface. After a suitable time, depending on the thickness of ware which is to be built up, the remaining slip is poured from the mold which is then allowed to stand, with or without artificial drying, until the clay can be handled.

Before it can be fired in the bisque kiln, ware must be properly supported. In the case of plates and other flat objects, this means bedding in a highly refractory American kaolin. Stacked plates are first separated by use of

parting clay and then the space between the edges is tightly packed with a mixture of fresh kaolin and clay which has already been through the kiln. Once ready for the kiln, the ware is packed into saggars formed from a refractory fire clay and the spaces filled in with small ware.

The Court Plant was originally equipped with eight periodic kilns, four for bisque and four for glost firing. The greater part of its production is now fired in tunnel kilns. There are three of these, a bisque kiln which has just been completed, a small decorating kiln, originally heated electrically, but now converted to recirculating gas-tube firing, and a glost kiln of the walking beam type which is fired by a unique method later to be described. Waste heat is recovered from both the first and the last of these kilns.

Flexibility in fuel usage is the outstanding characteristic of the new bisque kiln which was designed and built by the Swindell-Dressler Corp., in collaboration with the pottery staff. At present this and the other kilns are fired with a high quality Pennsylvania natural gas of 1,021 B.t.u. heat content, which is 99 per cent methane. As this fuel contains no deleterious substances, the elaborate precautions taken to avoid contamination of the kiln atmosphere are at present unnecessary. They were made, however, in anticipation of possible future need for changing to a less desirable fuel, such as coke oven or producer gas. A second feature of the design of the new kiln is its ability to recover a large proportion of the heat in the gas fuel. By use of a heat exchanger, part of the heat is recovered in air which is supplied to the dryers already mentioned, while much of the remainder may be discharged into the buildings at a relatively low temperature for winter heating.

The bisque kiln has a length of approximately 182 ft. between center lines of transfer tracks and contains a single track on which cars enter at intervals of 160 minutes, pushed in by means of an hydraulic pusher. The car capacity of the kiln is 27 and the total time a car is

in the kiln is 72 hours. The average throughput is 9,000 dozen pieces per week, at an average weight of 9 lb. per dozen. The kiln is divided into three sections, including an entrance or preheating section, a firing section and a cooling section. No burners are provided in the entrance section as ware is preheated by the products of combustion moving from the burner zone to the exhaust fan. The firing section comprises three zones, each of which is separately and closely temperature controlled using a Leeds & Northrup full-proportioning controller.

Two sets of burners are provided in the firing section, an upper set including five burners on a side which fire into the side-wall muffles, and a lower set comprising eleven un-muffled burners on a side, firing into openings in the sagger-supporting platform on the kiln cars. If at some later time a sulphur-containing fuel gas becomes necessary, the lower burners may be supplied with a refined hydrocarbon gas such as butane. Combustion gases from the lower or auxiliary burners travel through a flue built into the car refractories and discharge into the muffles through a number of openings in the fore part of the firing section. The muffles are maintained at a negative pressure by the products-of-combustion fan.

Gas and air under slight pressure are supplied to the burners in the ratio of 1 to 3 from mixing valves regulated by the control system. Secondary air is drawn into the muffle from the cooling section, to which it is supplied by a small fan. Thus, the secondary air after passing over the ware reaches the burners at a temperature from 1,500 to 1,800 deg. F., materially assisting in reaching the top ware temperature of about 2,250 deg. F.

In the cooling section, cooling is accomplished both directly in the manner already noted, and indirectly by the use of air-cooled muffles in the side walls. Air is drawn through the muffles by means of a fan, discharging to the waste heat system at a temperature of about 250 deg. F. Ware leaves the kiln at about 200 deg. F.

To avoid heating the car trucks and their bearings to a temperature above 500 deg. F., a third fan is provided to draw cooling air past the metal substructure of the refractory decked car trucks. The space beneath the car decks is separated from the kiln proper by a continuous sand seal. The track cooling air, at a temperature of

180 deg. F., mixes with the air from the cooling muffle and flows to a mixing chamber where it meets air heated by a heat exchanger in indirect contact with the products of combustion. The latter are withdrawn from the kiln muffle through underground ducts and pulled through a J. O. Ross plate type heat exchanger by means of the products-of-combustion fan. This fan is arranged to discharge either to the atmosphere or to the room. Room air is drawn through the heat exchanger, issuing at a temperature of 350 deg. F. and passing into the mixing chamber. Thermostatically controlled louvers admit additional room air to the mixing chamber so that the mixture drawn off by the waste heat fan and supplied to the dryers and slip casting department is held at a temperature of 160 deg. F.

The exterior surfaces of the kiln are of a buff-burned building brick while the muffle in the hot zone is constructed of silica brick, sillimanite and Alundum. In the hot zone, the crown is a New Jersey clay brick, a little higher in silica than usual firebrick compositions. The balance of the kiln is of No. 1 firebrick and the crown insulation, 15 in. of Johns-Manville infusorial earth. The walls are similarly insulated with infusorial earth plus insulating silica brick.

One novel and interesting feature of kiln operation is the use of a test car which is kept loaded at all times, ready to be put through the kiln in case the effect of some change in kiln operation is to be determined. This car is equipped with three platinum thermocouples, one at the top, one at the side and one at the bottom of the load. The terminals for these couples are carried down between the car axles and openings are provided in the kiln wall at frequent intervals through which a special coupling device may be inserted for connecting a portable pyrometer to any of the couples. Careful studies of hourly temperature changes are very important since the linear shrinkage during the firing is 10 per cent and the rate of shrinkage should be uniform.

After a car is removed from the kiln and the contents cooled sufficiently for handling, the saggars are removed, the ware lifted out and the parting clay scraped off under an exhaust hood. The ware is then packed in rubber-lined tumbling barrels so that its movement is restricted and the remaining parting clay completely removed. After inspection, each type of ware is transported to its proper place in a storage warehouse where more than a million pieces are regularly kept on hand in the unglazed, undecorated condition. The company regularly stocks some 1,400 different sizes and types of ware. These are, in the main, produced in the relatively heavy ware used by hotels, clubs, schools and institutions. A smaller part of the production is thin ware of a type sold for household use. In addition to numerous special patterns, over 3,000 stock decorations are employed.

Nearly every method employed in the graphic arts is used in one form or another in the decorating of tableware. The two principal processes are the copper plate and the decalcomania methods, supplemented by hand striping. In the first of these, designs pro-

Decorating kiln, equipped for gas-tube firing



duced by the pottery's staff of artists are engraved on copper plates, either by hand or photo-chemically, and the design printed on tissue paper, using an appropriate metal oxide pigment suspended in a vehicle which remains tacky for a considerable time. While the vehicle is still tacky, the paper carrying the design is cut to the proper shape and rubbed on to the ware so that the design adheres. The paper may then be removed by washing. This method is suitable for designs having not more than two colors. However, much more intricate decorating can be accomplished with the use of decalcomania. The Onondaga Pottery is believed to be the first manufacturer of ceramic decalcomanias in the United States, for which purpose a large, fully air-conditioned manufacturing department is maintained. Twelve or more colors can be used in a single pattern.

Application of decalcomania is somewhat more complex than that of the copper plate print. It is necessary first to size the decalcomania print or the ware or both, after which the decoration is transferred to the ware by applying, rubbing, washing off the paper, and drying. Before it can be glazed and fired, underglaze decalcomania decorated ware must be put through the decorating kiln, later to be described, for the hardening of the design. By this means the sizing is removed.

Decorations may also be applied by hand painting and ware decorated by one of the above described methods generally requires skillful hand striping. For certain sorts of designs, stencils and an airbrush are used. One of the most difficult problems in the decorating of china is the choice of suitable pigments. A wide range of metallic oxides is used, many of which fire to a totally different color than that in the unfired state. Extremely close laboratory control of raw materials is necessary in the pigment making department, and it is requisite that careful color control tests be run on all materials received.

After the underglaze decoration has been applied, the ware must be glazed. A raw or unfired glaze consists of a finely powdered glass of suitable composition, having a coefficient of expansion carefully adjusted to that of the ware. The glass powder admixed with certain other materials, using electrolytes to form a slip of cream-like consistency, is suspended in water. This may be applied to the ware either by dipping or spraying. Dipping is the method more commonly used in the Onondaga plants.

Glazing the Ware

Glaze is prepared by prolonged ball milling at the main plant, and is shipped to the Court Plant with its specific gravity roughly correct. Before use the gravity is accurately adjusted to 1.748 and the viscosity corrected by the use of electrolytes, with the aid of a standard flow type of viscosimeter. Proper specific gravity, viscosity and "yield point" are extremely important since they control the uniform retention of glaze on the ware. As with so many other pottery operations, glazing is a skilled hand operation, carried out by workmen who have acquired a feel for the job which enables them to predetermine the thickness of glaze application within close limits. Glazing is accomplished by dipping the ware in the glaze slip, followed by a rapid twirling and shaking of the ware, thus throwing off surplus glaze. After glazing, ware is air-dried, ready for placing in the glost kiln.

The glost kiln at the Court Plant is of a type which has no exact counterpart elsewhere in industry. It was built by the Swindell-Dressler Corp., using features de-

veloped and patented by C. H. Parmelee of the pottery staff, and assigned to the pottery. The kiln is of the walking beam type and achieves a completely controlled atmosphere by having all firing take place within muffles. The side wall muffles are of the standard Dressler type, but underfiring is accomplished by building the two parallel walking beams in the form of muffles which are connected to the fuel supply and exhaust systems with flexible hose. Rubber is used for fuel and air and metal hose for the products of combustion. An electrically timed hydraulic mechanism synchronously operates the walking beams. The kiln is 101 ft. long, has a capacity of 5,000 dozen articles per week and a total cycle of 36 hours. Two firing zones are automatically controlled, using a three-point Micromax control. The peak temperature in this kiln is about 2,100 deg. F. Heat is not yet recovered from the products of combustion, although the ware cooling air is withdrawn by a fan and is available for building heating. A second unit is contemplated.

Under- and Overglaze Firing

After passage through the glost kiln, most ware is ready for its final polishing and inspection. However, ware which is to be decorated over the glaze must be returned to the decorating department for application of decoration on the glazed surface. It is then passed through the overglaze decorating kiln. Such treatment is known as overglaze firing and is performed in the same kiln in which the underglaze decalcomania is hardened on.

Originally electric-fired, the decorating kiln, which is 50 ft. in length, has been converted to gas tube firing using the Kemp system of pre-mixing gas and air. This installation was the first to use gas tubes in pottery work. The gas tubes are of chrome-nickel steel castings, formed in a horizontal, rectangular loop. A burner fires longitudinally into one of the long legs of the rectangle and the products of combustion pass around the loop to the end of the other long leg, near the burner, where they are discharged. A bypass, which completes the "loop", conducts part of the combustion products from the point of discharge back to the point of entrance of the unburned gases. By this means rapid circulation of the combustion products is set up in the tube, giving good distribution of the heat and avoiding the development of a hot spot near the burner. The products of combustion are collected and discharged from the building, with the exception of a portion which is returned to the preheating zone for initial heating of the ware. In this kiln, which attains a maximum temperature of about 1,400 deg. F., the ware is stacked on Q-Alloy metal trays supported on Chromel alloy rollers. Trays pass through the kiln in 13 hours, advanced by a pusher and dog mechanism. The kiln capacity is 5,000 dozen articles per week.

After the final firing, ware is transported to the polishing department, where any small blemishes arising from the supporting of the ware in the kiln are ground off and the ground spots polished. After careful inspection, ware is trucked to the warehouse, or to the shipping department where it is packed, generally in wood casks, bedded in straw, or occasionally in fiber-board cartons.

In the foregoing, an effort has been made to stress the engineering features of modern pottery practice. But without the wholehearted cooperation of the manufacturing organization in charge of the Court Plant, the detail with which these facts have been presented would have been impossible.

Structural Means for Preventing Corrosion

By PAUL SCHAFMEISTER and
HERMANN BRAUN

THE CORRODING ACTION of different chemicals can be largely prevented by a proper selection of structural materials. It is possible as well to change chemical conditions in such a way as to induce a pronounced corrosion resistance in the materials used. The fact that constructional measures might have an influence on behavior of materials and, therefore, should be considered in designing equipment was not well known until recently.

There is no end to mistakes in designing chemical equipment, which lead to increased corrosion as a result of galvanic action. They are produced by juxtaposition of metals having different electrochemical potentials towards a given electrolyte and by the presence of conducting connections.

Structural means for reducing corrosion caused by the galvanic action can be logically developed. The simplest way, the elimination of contacts between different metals, is not always possible. Some means must be found to overcome it in some other way. This can be achieved, for example, by coating one of the metals coming in contact with the other. The dangerous potential can be reduced here by coating both of the metals with a third. Inserts of a third metal are quite advantageous in bolted connections. Zinc or cadmium foils can be used here in joining iron or copper containing alloys with aluminum or aluminum bearing alloys. Metallic substances are protected sometimes by coating them with less noble metals, such as with zinc, used in galvanizing of iron and copper alloys.

Many metals can be used as a protective coating for prevention of a galvanic action, and the use of insulating materials or application of protective coatings can be recommended. Rubber, synthetic resins, and other non-conductors are suitable for this purpose. For light aluminum base metals, an insulation by means of oxidic coating can be provided. Another cause for galvanic failures is brazing. Welding, using the same material, is far less dangerous.

Another phenomenon similar to galvanic corrosion is observed when particles of the same metal or of some electrochemically inert substance come in contact with the metal in the presence of an electrolyte. Contact corrosion takes place here. Similar action is observed when iron is in contact with glass, packing material, etc. Similar corrosion phenomena are observed at the edges of rivet heads. This suggests the replacement of rivets with welding in as many places as possible, even when disregarding a further disadvantage of riveting, deformation of the metal often occurring in the neighborhood of rivets.

Fortunately, the cases when this type of corrosion is found in practice are much less frequent than would be expected. A sound means for preventing it is interposition of a less noble metal between any two metals,

which, being destroyed in the course of time, protects the material of the apparatus.

There are other chances for increasing corrosive conditions by structural mistakes or inappropriate handling of equipment. In the first rank among them are changes in concentration, composition and temperature. It is not often thought, for example, about emptying vessels. It might happen here that liquid remaining on the walls might affect the attack in an entirely different way than the original on account of its decomposition or drying.

There are frequently cases in which the damage is done by the action of corrosion products. A piping through which a weakly acid solution of ammonium nitrate and ammonium chloride was flowing was destroyed in this way. This piping was constructed partly of iron and partly of corrosion resisting steel. The result of this was that the iron chloride formed was carried into the portion of piping made of stainless steel and destroyed it.

Elimination of all dead corners is very desirable in constructing equipment, because it prevents the possibility of the precipitates being deposited in them. One must provide proper facilities for regular cleaning of the places which can be easily covered with deposits. These protective measures must be provided on the outside of the equipment as well.

Containers are often damaged because the liquid might boil and run over the containers and attack the steel or wooden setting. The upper edge of such devices should be carefully designed and provided with broad flanges.

Properly Designed Equipment Remains Dry

Much equipment is prematurely taken out of commission, because it is corroded from the outside by some liquid. Any piece of equipment must be so designed that it remains dry. This point is quite often overlooked in dyeing plants. They often use wooden vats lined on the inside with metal, and the danger is only more intensified because wood becomes saturated with liquid. Much care should be expended here for good ventilation of vats and the provision of means for easy removal of liquid, which might come in contact with them.

When heat insulated devices are to be considered, particular care should be exerted to keep the heat insulation from becoming wet. Otherwise, not only the insulation, but the apparatus underlying it, will be in danger.

Intensified corrosion can originate in such pieces of apparatus in which air is admitted besides the corroding liquid. It is known that in many cases corrosion attack follows the plane of contact of liquid with air. In such a case, truly resistant materials can be judiciously specified. This can be achieved either by protecting coating, introduction of masonry, or by inserts of particularly resistant metallic substances in the shape of sheets in the welded-on state.

Finally, it must be pointed out that chemical equipment is often corroded because some liquid leaks through connections, and instead of instantaneously mixing with the rest of the liquid in the container, flows over the cover or walls of the apparatus. When one has to deal with strongly corroding liquids, it is much better to introduce them in the apparatus by means of pipes fitted into proper sockets. By this means any unnecessary loading on any of the walls is eliminated and carried by easily replaceable pipes.

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Labor Pushes for 40-Hour Week in Chemical Industry By International Convention

By THEODORE J. KREPS

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WHAT'S HAPPENED SO FAR

- 1903 The United States begins financial support of the International Labor Office, then a semi-official research organization at Basel, Switzerland.
- 1919 First session of the International Labor Conference held in Washington, D. C.
- 1935 At its nineteenth session held in Geneva, the International Labor Conference adopts a resolution to consider the feasibility of reducing hours of work in the chemical industry.
- 1936 A preparatory technical tripartite meeting on reduction of hours in the chemical industry called at Geneva, 57 representatives from 11 major chemical producing nations being present.
- 1937 At its twenty-third session, the International Labor Conference, composed of representatives of 52 nations, approves a Draft Convention on Reduction of Hours in the Chemical Industry by a vote of 76 to 42, which, however, does not constitute the two-thirds majority necessary for adoption.

THE AMERICAN CHEMICAL INDUSTRY has recently received considerable international mention. In June of this year at Geneva over 150 representatives from more than 50 nations came together to consider, among other things, the achievements of American chemical enterprise. Speeches were made in many languages expressing admiration for the way in which chemical manufacturers in the United States in recent years have kept down the length of the working week to about 40 hours without lowering wages or notably increasing costs and prices. In fact a powerful body of opinion exists that such accomplishments should be on a world-wide scale.

By process of international agreement upon such items as the maximum length of the working week many groups in other countries are trying to establish a floor of competitive conditions which will place everybody on an equal footing. Needless to say such attempts to lessen the excesses of low-wage competition may benefit American chemical business a great deal. Domestic markets will suffer less from the evils of low-wage dumping. Exporters will have a fairer chance. Greater purchasing power and higher standards of living will mean more business all-round. Unfair competition will be considerably reduced.

At the present time no one can afford not having some degree of familiarity with the work of the International Labor Organization. For it has been a going concern ever since the year 1900 when its predecessor, the International Association for Labor Legislation, was founded

at Paris. Its present form dates from the year 1919, when the Treaty of Versailles was signed.

The International Labor Organization, as such, is composed of two integral parts: (1) a general conference of representatives of member nations, in sessions for about three weeks each year, the first having been held in Washington, D. C., in 1919 and the last or twenty-third in Geneva, this past June; and (2) an International Labor Office, now permanently housed in a large well-appointed building on the shores of Lake Geneva, the successor to the International Labor Office at Basel which the United States helped to support from 1903 to 1920. More nations belong to the International Labor Organization than belong to the League of Nations from which, of course, it is wholly separate in aim, function, organization, and direct control.

The general conference is composed of representatives of the various member states such as Italy, Japan and the United States, four from each country, two representing the government, one the employers, and one the workers. At the June, 1937, session, high political figures such as U. S. Assistant Secretary of Labor Edward F. McGrady, were in attendance from practically every important country in the world. In addition there were present such well-known personalities in the European chemical world as Richard Lloyd Roberts, Chief Labour Officer for the Imperial Chemical Industries, Ltd.; General L. Lheure, managing director of the Grande Paroisse Chemical Co. of Paris; Dr. Vladimir Jedlicka, secretary general of the Federated Chemical Industries of Czechoslovakia; Jacques Vervaeck, Inspector General for Labor Protection, Minister of Labor, Belgium; Nicholai Naess, president of the Norwegian Union of Workers in the Chemical Industry; Edward Trepka, director of the United Polish Chemical Industries; Senator Karl Wistrand of the Swedish Iron and Steel Trade Employers' Association; and Reginald Hewitt, Labour Manager of Clayton Aniline Co., Ltd., and Secretary of the British Chemical Employers' Association.

The agenda this year was an unusually heavy one, six draft conventions in addition to the numerous routine reports and resolutions coming up for consideration. Four of these received the necessary two-thirds majority required for adoption, the most important being a convention limiting the length of the working week in the textile industry to an average of 40 hours. To date a total of more than 50 conventions have been adopted by the various sessions of the general conference and submitted for ratification.

The second part of the International Labor Organization, namely, the International Labor Office, is controlled

by a Governing Body upon which the United States as a "state of first industrial importance" has a permanent seat. Its staff, now numbering about 300, most of them highly trained experts in the area of labor economics, is supervised by a director, Harold Butler, and four assistant directors, one of whom is that distinguished American, ex-Governor John Winant of New Hampshire, formerly chairman of the Social Security Board. Its task is largely one of research and of preparing the documentation for the various meetings of the Governing Body and for the sessions of the general conference.

The interest of the International Labor Organization in the chemical industry began in 1935 when at its nineteenth session the general conference passed a resolution requesting that the question of reduction of hours in the chemical industry be placed upon the agenda of a subsequent session. The Governing Body in October of that year requested the office to make a comparative study of the principal existing statutory provisions whether general or specific, which in the various countries concerned limited hours of work in the chemical industry.

Together with other documentation, the report of this study was submitted to a special meeting of chemical and economic experts in the chemical industry held at Geneva in December, 1936. To this meeting the United States sent only a government delegate, although countries employing more than 40,000 persons in the chemical industry were invited to send three delegates, one to represent employers, another to speak on the behalf of labor, and the third to state the position of the government. Each delegate takes as many advisers as seem necessary. British employers, for example, last December sent five technical advisers in addition to a delegate, while British Workers fortified their representative with six advisers. After examining the general arguments for and against reduction of hours in the chemical industry, the experts drew up a report, naming the specific branches of chemical enterprise which could for the purpose in hand be reasonably included in the chemical industry.

Between December, 1936, and June, 1937, the office staff conducted further research on the various points at issue and drafted a report presenting a summary of all the available, pertinent results. At its recent session the general conference, after receiving the report, at once organized a chemical committee with instructions to make recommendations for action. After two weeks of debate the committee hammered out a draft convention which it recommended for adoption.

The substance of the proposed draft had, of course, been years in the making, not only representing a synthesis of various national laws defining, regulating, and providing for reduction of hours in the chemical industry, but also embodying the end-product of much consultation with the legal experts of various governments. Its specific provisions, while too detailed for discussion here, in general implement the limitation of the length of the working week in the chemical industry to an average of 40 hours.

The chemical committee presented the draft convention to the general conference which approved it by a vote of 76 to 42, only three votes needing to be switched to have secured the two-thirds majority necessary for adoption. Consequently the convention may be held over for a second discussion next year, or it may be side-tracked in favor of a general convention reducing the hours of work in all industry. Considerations of strategy carried on behind the scenes between now and next winter will determine the choice of procedure next year.

But the mass of international opinion favoring the shorter work week is really surprising. Most of the opposition came, of course, from the employer groups and from the governments of Japan, India, Great Britain, the Netherlands, and Esthonia. Even Great Britain, however, was not opposed to the principle of the 40-hour week but doubted the wisdom of attempts to secure it by international convention, being fearful together with British employers lest there be lost to their industries some of the benefits of their system of collective bargaining, a fear, however, not shared by British workers. The strongest support came, of course, from the worker delegates, and from the governments of France, Belgium, Norway, New Zealand, Australia, Russia, Spain, and the nations of North and South America.

The arguments advanced for and against reduction of hours were on the whole not new. In fact American readers are sufficiently familiar with most of them to permit omission of summarization or mention. But American chemical manufacturers will be amazed, I am sure, if they carefully read the debates (as they should¹) to find how strong are the forces on the international scene now trying to bring the standards of hours, wages, and working conditions abroad up to the levels already existing in the United States. This year these forces just barely missed their goal. Next year or the year after that they may easily reach it. The movement to standardize, stabilize and improve conditions of labor by international action is daily gaining momentum. It is

a movement from which the American chemical industry not only can learn a great deal but from which it can benefit even more. Certainly it cannot afford to neglect being alert and informed. Labor marches on!

¹ Write the International Labor Office, 734 Jackson Place, Washington, D. C., and ask for Blue-Gray Report V, including the appendix to Reports IV and V, both bearing the title *Reduction of Hours of Work in the Chemical Industry*. Also put in your order for the regular printed volume or record of the *Proceedings of the Twenty-Third Session of the International Labor Conference* which will soon be available.



International Labor Conference at Geneva, Switzerland, June, 1937.

BARRELS Have Survived the Test of Time

By R. W. LAHEY

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THE barrel is of ancient and honorable lineage—it dates back as far as can be remembered. Its only competitor as a container through the centuries is the bag. Surely a package which has served man and industry so well for so great a span of years must be fundamentally sound. A short time ago, Howard Elkington, of the Philadelphia Quartz Co., wrote an outstanding article on the history, construction and advantages of the barrel—those features need no further elaboration.

The construction of the wooden barrel is worked out, not by accidental methods, but along scientific lines. The principle of the arch, formed by the stave accurately listed or shaped to conform to a given circle, is the first fundamental in barrel construction. As each stave rests in a set position and all are bound by external hoop pressure, the entire assembly of staves and heads becomes a compact whole. The staves are so listed that the lines of the joints, when projected toward the center, meet and form a series of acute angles. Due to this construction, any external impact or shock is automatically transmitted throughout every unit of material, and the resiliency thus afforded the barrel modifies the force of such impact.

We are concerned here with those construction details of the barrel which are important to any user in choosing these containers to meet specific shipping problems. It is essential to know the standard sizes and grades of staves and heading, the several methods of fastening and bracing heading, the relative strengths of the different types of hoops, the size of bilge, and many other features. An accurate knowledge of these details will assist the user in choosing an adequate container.

Two Classifications of Barrels

There are two classifications into which barrels and kegs logically fall. Tight barrels are carriers of liquids and slack barrels are used for solids. While the construction of these two types of barrels is basically the same, they differ in detail as to thickness and types of staves, hoops, heading, etc. They are also grouped according to size into three classifications. All sizes of *slack* up to 17½ in. by 24 in. are known in the trade as kegs, sizes from 17½ by 28½ in. up to 21 in. by 34 in. are barrels and those that are larger are *casks*. In tight cooperage sizes up to 25 gal. are usually classified as kegs—from 25 to 60

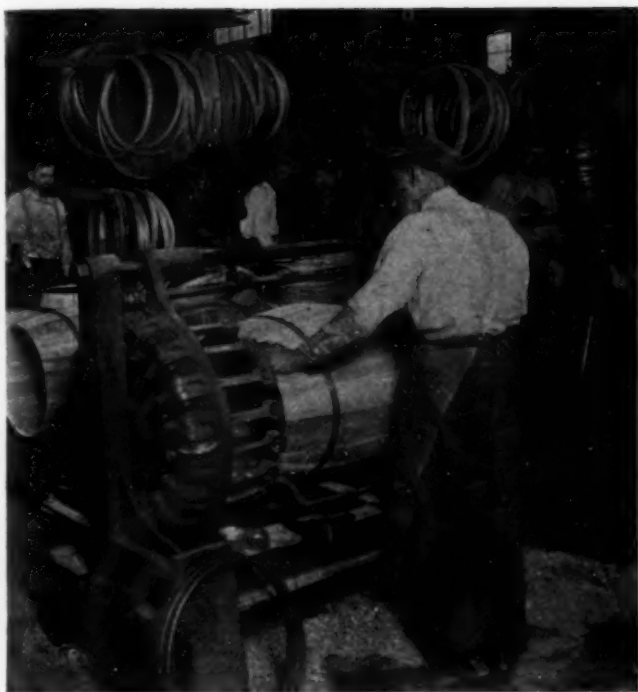


Cooperage shop showing crozed barrel before the hoops have been applied

as barrels, those above 60 gal. as casks and hogsheads.

Barrels are authorized by the railroads for the shipment of numerous commodities as evidenced by the Freight Classifications. The rules covering container specifications leave it largely to shippers to choose constructions which are adequate to carry the merchandise, not specifying as to staves, heading, and hoops. Thus the responsibility is placed on the shipper.

The Interstate Commerce Commission authorizes the use of both slack and tight barrels for the transportation of certain dangerous materials. Container Specifications 10A, B, C, cover tight barrels and 11A and B cover slack cooperage. Unlike the Consolidated Classification Committee Rules these I. C. C. specifications specify complete details of materials and construction. Included in the list of authorized materials are some flammable liquids and solids, a few corrosive liquids, and certain class B poisonous liquids and solids. Where small inner containers are



Barrel forming machine where the cooper chooses staves of the proper combination of widths for accurate formation of the barrel

used, such as tin cans or glass bottles, barrels are sometimes authorized as outer shipping containers provided adequate cushioning material is used.

Slack barrels are used to transport almost every conceivable kind of dry articles. Included in the list are such produce as potatoes, lettuce, flour, sugar, meats, etc. In the process industries slack barrels are among the most popular containers for powdered, granular and lump products. Therefore a thorough knowledge of the types, constructions and sizes is a great asset to all shippers.

Staves and heading are supplied largely by southern mills. There are definite Grade Rules and Specifications set up by the Associated Cooperage Industries of America, Inc., which are used as a basis for acceptance or rejection of cooperage stock. These rules specify a definite thickness of timber, the measurement of the bilge, the tolerances allowed on width of staves at bilge and quarter, the length weight and also the grades and the kind of wood. The following grading definitions of slack staves should be of interest to all barrel users:

No. 1 Staves shall be of uniform thickness, free from knots, slanting shakes, worm holes or dozy wood. Moderate stain, slight roughness, flat staves less than 4 in. in width across the bilge, cross grained which will not break or splinter in stressing, or slight warpage shall not be considered defects.

Mill Run Staves shall consist of run of the knife, well equalized, made from regular run of stave logs and shall contain 40 per cent or more of No. 1 staves. All dead culls out.

No. 2 Staves shall be free of slanting shakes over 1½ in. long, knot holes and unsound knots (but sound knots not over ¾ in. in diameter shall be allowed and shall consist of good sound workable staves). Moderate stain, mildew or discoloration, no defect. They shall be free from dead culls.

The cooper places his staves and heading in a dry kiln for several weeks for the obvious reason that barrels made from green timber are subject to excessive warping and shrinking after drying. Some users who pack while their products are excessively hot have found that shrinkage of even the kiln dried material is so great that the bilge and head hoops have to be redriven after a few days of storage.

Staves and heading are taken from the kilns for use in barrels. The first step in the construction of the barrel is to prepare the staves for use. This intermediate process includes the reaming out of the croze at both ends of the staves and the forming of the tongues and grooves on the sides. The individual who feeds the staves to the machines removes any unsatisfactory ones and at the same time so arranges the combination of different widths that they are about right for the cooper to form his barrels.

The staves then go to the barrel forming machine where the cooper chooses staves of the proper combination of widths for accurate formation of the barrel. This machine consists of a circular steel ring located close to the floor with another one about a quarter of the way up on the staves. After the complete circle of staves has been fitted into the two hoops, a wire rope is drawn around the upper portion and contracted, thereby forming the arched construction of the barrel. Heat supplied by charcoal stoves is often used in this bending process. Head and bilge hoops are then attached and the forming rings removed. Bilge hoops are usually driven down by hand.

Slack barrel staves are made with plain, and tongued and grooved edges. The latter provide more protection against sifting, although if the hoops are well driven down at all times, straight or plain stave barrels remain tight.

The strength of the barrel largely depends on the ability of the hoops to hold the staves in place. Wooden hoops were first used, but they had the disadvantage of expanding and shrinking according to the atmospheric conditions. They are still in use on barrels holding commodities which do not require tight jointed staves such as vegetables and fruits. Wire hoops improved conditions but they were not wide enough to adequately hold the staves in place.

Latest Improvements

The latest improvement is the steel band hoops. These were first used flat but later one side was beaded to increase strength and facilitate the operation of driving. These hoops are from 1½ in. to 2 in. in width and are fabricated from 18 gage to 23 gage steel to provide sufficient strength. The bilge hoops are held in place by hoop keepers which are large headed nails with extremely small shanks. The barrel user should be sure that the points of these nails do not extend into the inside of the barrels for they are liable to tear paper liners and cut the workers hands. Some hoops are prick punched so a small "V" of the hoop steel extends inward every few inches around the circumference, but this method of holding them in place is not as effective as the hoop keepers.

Heads are fastened on barrels with wooden hoops by the use of liners. These are thin strips of circular wood which are nailed to the inside of the staves at the joint of the head. There are usually two liners applied to each head as they must cover all heading joints. The steel band chime or head hoops have done away with the head liners as proper nailing through the hoops into the heads

make effective closures. Replacing elm hoops with steel hoops has resulted in tighter heads, as the elm hoops cannot stand the pressure which can be applied by steel. There is a machine which staples the heads through the steel hoops which makes the most secure fastening and is the cheapest if the volume of barrels to be headed is sufficiently large.

The bilge of slack barrels is of importance for it has a direct bearing on the capacity of the container and to a certain degree determines its strength. The bilge is formed by the difference in width of the staves at the center of the staves as compared with the ends. Thus the cheapest if the volume of barrels to be headed is follows:

18 in. to 22 in. in length.....	$\frac{1}{2}$ in. bilge
23 in. to 28 $\frac{1}{2}$ in. length.....	$\frac{3}{8}$ in. bilge
30 in. in length.....	$\frac{1}{4}$ in. bilge
32 in. to 34 in. in length.....	$\frac{3}{4}$ in. bilge

The barrel bilge can be varied and actually does vary in accordance with the coopers choice of staves. If a large percentage of wide staves are used the bilge will be smaller than if a large percentage of small staves are used. In actual practice the cooper chooses the assorted widths which will standardize the bilge size as nearly as possible for each type of barrel.

Bilge of the Barrel

The bilge of the barrel can be increased by the use of staves which are cut with bilges that are greater than the standard—for instance a 30 in. stave would be cut with a $\frac{7}{8}$ in. bilge rather than the standard $\frac{3}{4}$ in.

The selection of the head diameter, length of stave, and bilge size to obtain the proper capacity in the container should not be made without taking into account the cost of the combinations. A smaller head size combined with a large bilge is cheaper than a larger head size and small bilge. In the same way, a shorter length of stave with a large bilge is cheaper than longer staves with normal bilge. It must be borne in mind that as the bilge increases in size, the strength of the container decreases and if the transportation service is severe it would be ill advised to have barrels constructed with over-size bilges. This can often be taken care of in the grades of wood and the gage and width of the hoops. The following table shows the standard and largest size bilges of barrels of various sizes:

15 in. by 24 in. standard bilge	58 in. largest bilge	59 in.
16 in. by 24 in. standard bilge	62 in. largest bilge	63 $\frac{1}{2}$ in.
17 $\frac{1}{4}$ in. by 24 in. standard bilge	65 in. largest bilge	66 in.
17 $\frac{1}{4}$ in. by 28 $\frac{1}{2}$ in. standard bilge	66 in. largest bilge	68 in.
17 $\frac{1}{4}$ in. by 30 in. standard bilge	68 in. largest bilge	70 in.
19 $\frac{1}{4}$ in. by 30 in. standard bilge	75 in. largest bilge	77 in.
19 $\frac{1}{4}$ in. by 34 in. standard bilge	76 in. largest bilge	78 in.
20 in. by 30 in. standard bilge	78 in. largest bilge	80 in.
20 in. by 34 in. standard bilge	79 in. largest bilge	81 in.

The number of hoops used and their location on the barrel play an important part in the strength of these containers. We must not lose sight of the fact that the function of the hoops is to hold the container together and they therefore must be stronger than the staves and heading. If this is not the case the full value of the staves and the heading can not be obtained. Often six hoops are used on barrels which have to carry excessively heavy loads. The extra hoops are located midway be-

tween the bilge and head loops and are called quarter hoops.

Hoops must be located where they will do the most good. As the bilge is the part of the barrel requiring the most support, the closer the hoops are to this point, the stronger. They cannot be located too close or they might slip over the bilge, therefore as a general rule, bilge hoops are located $\frac{1}{3}$ the length of the stave from the heads. When quarter hoops are used, this distance is sometimes increased slightly.

Strength of Steel Hoops

Strength of steel hoops varies according to gage and width. These range from 18 gage to 23 gage and the width from 1 $\frac{1}{4}$ in. to 2 in. Hoops are sometimes galvanized, also painted in a choice of colors. This is done not only for protection but for package identification purposes.

A common method of reinforcing heads is to use wooden battens. They are applied in a direction at right angles to the direction of the head pieces and are fastened to the chimes by nailing through the head hoops or by steel straps. The ends of these cleats should be curved in order to conform to the contour of the heads of the barrels. They can then be more securely fastened and will better reinforce the heads.

A knowledge of the details of construction and the strength limits of the many features are required to choose the most economical type and which will supply the proper amount of protection. Surely the barrel needs no individual to sing its praises—its long and satisfactory service to shippers through the ages speaks for itself.



Steel band hoops are beaded on one side to increase strength and facilitate operation of driving



ACHEMA VIII

Through the Eyes of an American Chemical Engineer

By GUY N. HARCOURT

NEW YORK MANAGER
BUFFALO FOUNDRY & MACHINE CO.

MY OUTSTANDING IMPRESSION gained from a visit to Achema VIII is that the German Reich and chemical industry cooperated wholeheartedly and generously to make this world-famous chemical engineering exposition an unqualified success—not only as an exhibition of chemical engineering equipment but also as a center for the exchange of scientific knowledge and practical experience.

Achema was formally opened on Friday, July 2, when several hundred invited guests gathered in the wide central aisle of Hall I on the famous Fair Grounds at Frankfort-on-Main. Addresses of welcome were made by Prof. Dr. P. Duden, Chairman of the German Association for Chemical Apparatus (Dechema), by Oberbürgermeister Dr. Krebs and others. Reichs Chancellor Adolf Hitler was officially represented by his Chief of Staff. At the conclusion of the ceremonies, the Achema was opened to a special inspection by the guests.

The exhibits were, as far as possible, divided into groups and each group had been given a separate building or section of a building. In Hall I we found a complete collection of all sorts of glass, porcelain and precious metal laboratory apparatus which ranged all the way from the humble test-tube to the most intricate fractionating columns. Zeiss Jena, Ernst Leitz, Bush and others exhibited a bewildering array of microscopes and other optical aids to analysis. There was a camera microscope which could be used for monocular or binocular observations by incident, transmitted or polarized light, for metallography, photomicrography, as well as for other purposes. There were spectrosopes, refractometers, delicate balances and all the other modern aids of the laboratory chemist. Around the walls of the building were displayed the more rugged but still scientifically

precise plasticimeters, viscosimeters, and control and regulating devices for temperature and pressure. An interesting plastographic machine measured and recorded graphically the changes in plasticity as substances were mixed under various conditions of temperature and for different lengths of time.

Somewhat larger than laboratory scale was a 250-gal. still with a silver-clad body, silver heating coils, silver fractionating columns, condenser and receiver.

In Hall II, we found full-scale apparatus constructed of non-metallic materials such as stoneware, acidproof brick, glass, silica, rubber and synthetic resins. The display of stoneware pumps, exhausters and similar equipment was particularly impressive. One unique item was a ventilator in which a stoneware impeller was driven by a motor totally inclosed in stoneware. More impressive was a full-sized apparatus for the concentration of sulphuric acid by the Schott process, constructed entirely of Dioxil (fused quartz). Nearby was a cooling coil 3 ft. in diameter and made from a single glass tube 180 ft. long. Several exhibitors showed plant-size glass distillation columns.

Stoneware vacuum stills of 300 to 400 gal. capacity had been set up ready to operate. Large-sized apparatus constructed of synthetic resins was frequent; a large agitator covered with a resin coating was exhibited in one booth and close by was a kettle lined with porcelain brick set in similar resin. It was claimed that this kettle could withstand temperatures up to 200 deg. C. For conveying corrosive gases, concrete pipe lined with synthetic resin was shown by two exhibitors. A number of firms showed apparatus lined with rubber, both hard and soft. A few containers were lined with the new I.G. Farbenindustrie synthetic rubber, "Buna," although this

does not seem to have come into extensive use as yet in chemical equipment. A rubber belt with turned up edges was displayed by Franz Clouth, Rheinische Gummiwaren Fabrik. The upturned edges were shirred so that as the belt passed over the pulleys the edges could straighten out and would not collapse or tear. Another interesting exhibit displayed glass wool in many forms—as a fabric, insulating agent against both the transfer of heat and electricity, and as a filter media.

Several models of large-size apparatus constructed of acidproof brick were shown. In the construction of the models, the brick used had been made to scale and were no larger than small tile. Some were of irregular shape so designed that they interlocked, eliminating any continuous joints or planes along which cracks might form.

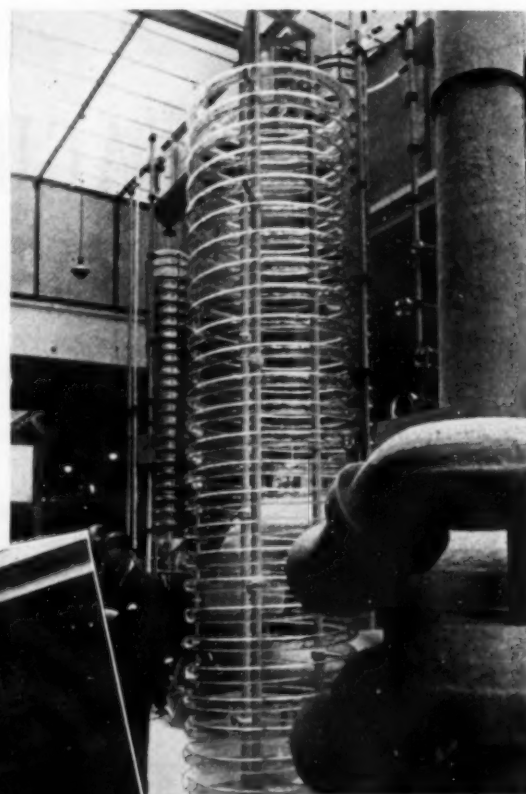
In another section of Hall II was a complete exhibit of all types of synthetic materials—leather, wool, resins, molding compounds, celluloid and casein plastics, in fact, all the materials which the German chemical industry is now so skillfully developing from domestic raw materials. Since this section had been designed to have a popular appeal and to act as propaganda, the raw materials were symbolized by a huge pile of coal, a glass vessel of water, and another glass container filled with air.

In the center of this hall was a covered vessel nearly 60 ft. long, about 4 ft. wide and 3 ft. deep, constructed entirely of phenol-formaldehyde resin. It was claimed, and it easy to believe, that this is the largest vessel ever constructed of a plastic material.

In Hall IIIa was perhaps one of the most attractive exhibits in the whole exposition—an operating apparatus for the production of the new synthetic fiber, Zellwolle. The cellulose solution could be seen entering the alkaline bath in fine brown strands which later appeared as a

silky material being laid back and forth across a moving conveyor on which it was washed. It was then pressed free of moisture and cut into lengths for incorporation with natural wool in a ratio of 40 parts of Zellwolle to 60 of natural wool. The finishing touch was a handloom upon which a couple of vivacious German girls were supposed to be weaving the wool into cloth. Samples of fabric produced elsewhere seemed to be of good, soft quality and texture.

In the same hall was exhibited vacuum mixing and kneading machinery for xanthate and also a newly developed dipping press for the continuous handling of cellulose in the manufacture of viscose.



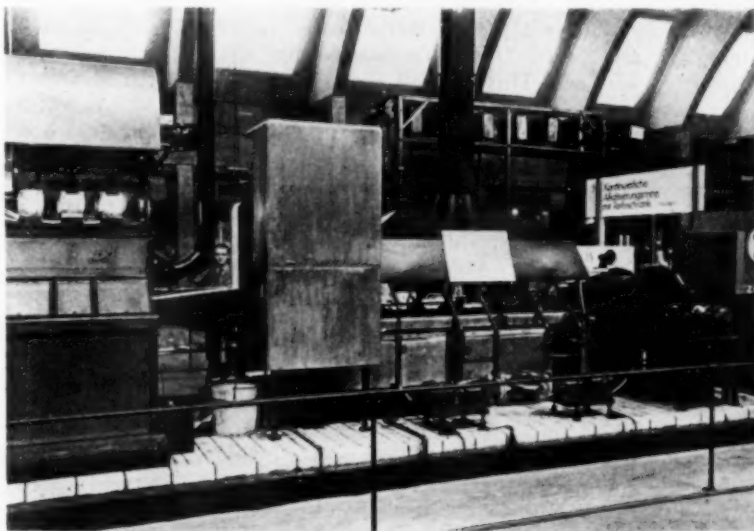
Above: Glass cooling coil 180 ft. long. Left: A corner of the glass equipment exhibit



Below: Silver-clad still with silver column, coil, condenser and receiver

Hall IIIb had been converted into a library where German chemical literature was laid out on tables. Complete files of the translations and publications of the various German chemical societies were available, in one case covering a period of fifty years.

Hall III was given over to exhibitions of apparatus which are, in a sense, only accessories to the chemical industry. Various metal castings were displayed, including an aluminum-bronze centrifugally-cast worm gear blank, 2,600 mm. in diameter. Elsewhere in the building were exhibited copper-plated steel rolls, a full-size single effect evaporator of stainless steel, an operating refrigeration system of the vacuum type in which the vacuum was



produced by means of ejectors. Disintegrators and pulverizers were also found here.

Upon entering Hall IV, one noted immediately the over-head crane available for moving heavy pieces. A railroad track passed through the far end of the building so that exhibits could be lifted from the cars by crane and set down in position.

As was appropriate, the largest exhibit, both in area and size of pieces shown was that of Krupp. On the right was a steel sulphate pulp digester with a capacity of 70 cu.m. On the left was the upper part of a sulphite digester built of formed plates of stainless-clad steel, tack welded into position. After the Exposition this piece was taken apart and shipped to its destination for final assembly on the job. When completed it was to be 5,500 mm. in diameter and 14,800 mm. in overall height. In the same exhibit was a jacketed stainless steel kettle with agitator, and a dished head—to be used as the bottom of a reaction kettle—with wall thickness of 70 mm. and clad with a 3 mm. layer of stainless steel. On the floor was a head to be used in the construction of a cellulose cooker. This was also of stainless-clad steel, was 2,767 mm. in diameter, and had one diametrical weld. In front of this head was a stainless steel roll in which grooves had been machined so that it might be used as a forming roll in connection with an air dryer. The roll was 15 mm. in thickness and was an outstanding example of beautiful workmanship in the machining of stainless

steel. Elsewhere in this exhibit was shown vessels which had been tested to destruction in order to show that the stainless steel welds were as strong as the original metal.

Further along, a Bamag Electrolyzer had been set up. This is a large scale apparatus for the industrial production of hydrogen and oxygen by electrolysis. Where electrical power is cheap, electrolytic gas may be produced on a large scale economically. The apparatus had the appearance of an enormous filter press, since the individual cells are separated by diaphragms of an asbestos fabric. It is claimed that gas is produced in about five minutes after the current is turned on and that extremely pure hydrogen and oxygen may be manufactured con-



Above: Bamag Electrolyzer for production of oxygen and hydrogen by electrolysis



Above: Krupp heavy equipment exhibit. Above, left: Process equipment for making Zellwolle, new German synthetic fiber

tinuously over long periods interrupted only by monthly shutdowns to change the electrolyte filters. Many installations have been made in Europe but only one in the United States. As the cost of electric power is reduced, the use of this apparatus is expected to increase.

At the far end of the hall was a huge pressure vessel exhibited by the Rhein-Metall Borsig A.G. and to be used as a percolator in the manufacture of sugar from wood. This cylindrical cone-bottomed vessel had a working capacity of 50 cu.m., was 2,700 mm. in diameter and 14,700 mm. in overall length. The wall was 33 mm. thick and had a homogeneous lead lining of 6 mm. The total weight was 42,000 kg.

Maschinenfabrik Imperial G.m.b.H. had set up seven different types of rotary vacuum filters. These were all of the so-called string type in which the filter cake is removed on strings, flat chains or a cloth belt passed around the filter drum and over the filter medium, or on heavy cord which forms the filter medium (Wright patent). One type was shown in which all parts except the filter cloth were of porcelain. All of the filters were in operation.

Here was also exhibited a small-size Aeroform dryer. In this dryer the material to be dried is pressed into the grooves of a drying roll and held there by a cloth belt until it is partially dried and solidified. It is then removed from the grooves and falls on a continuous belt carrying it into the air-drying chambers. This type of dryer is familiar to American chemical engineers, but is mentioned here to indicate the completeness of the exhibit.

Samesreuther & Co. G.m.b.H. exhibited jacketed vessels in which their special method of construction was employed. In this construction, circular depressions are formed in the jacket at regular intervals. These are of sufficient depth so that when the bottom of the depression is in contact with the inner vessel, there is an adequate jacket space. Holes are pierced through the jacket at the bottom of each depression and the jacket is then welded to the inner vessel around the circumference of each hole. This gives a strong construction without the necessity of piercing the inner vessel. These vessels have been constructed for jacket pressures of 500 lb. per sq. in. at 240 deg. C. The same company also exhibited a kettle body made of stainless-clad steel designed for 30 lb. per sq.in. internal pressure. The jacket was designed to withstand superheated steam at 150 lb. pressure and 400 deg. C. superheat.

Mako & Vacuum Trockner G.m.b.H. exhibited a new type of vacuum shelf-dryer which can be built up to any desired size by stacking and bolting or welding together individual shelf assemblies. The two long sides of the shelves consist of channel irons which when stacked form the side walls of the dryer. Cast iron vacuum shelf-dryers were also shown as well as the other types of vacuum apparatus. Most of these designs, however, were the same as those with which we have long been familiar in the United States.

A number of evaporator designs were shown. Kühnle, Kopp & Kausch exhibited an evaporator with inclined tubes which is known as the "Vogelbusch" high-effect rapid-current evaporator. In the German design, little attention seems

to have been paid to the prevention of entrainment. Re-compression evaporators are widely used in Germany, and many manufacturers advertised them although none was exhibited at Achema.

Drum dryers of the single or double drum type, both atmospheric and vacuum, were exhibited by the Deutsche Vacuumapparate and were advertised by several others. The apparatus shown differed only in minor details from that produced in this country.

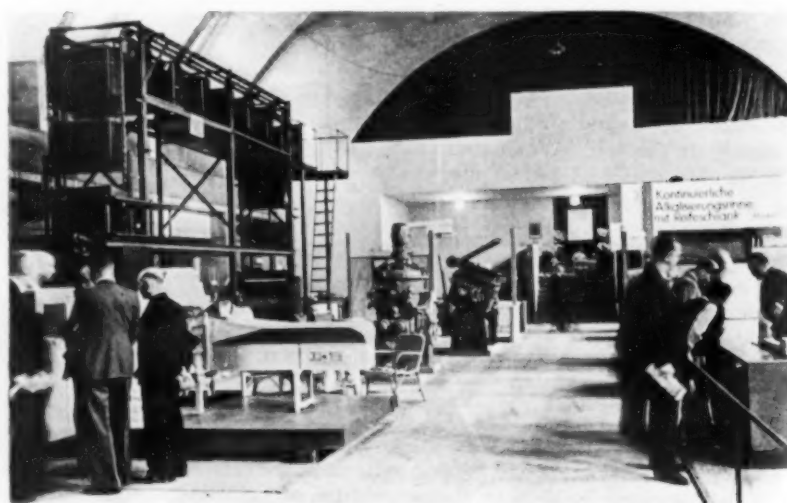
Air dryers were well represented in Hall IV. One exhibit had set up a complete dryer in which the material being dried could be seen on the rotating shelves, the direction of the air being indicated by the fluttering of brightly colored streamers.

An interesting application of the previously-mentioned rubber belt with vertical sides is its use as a crystallizer as was exhibited by Zahn & Co. The essentially horizontal belt passes over slightly raised supports at each end of its travel so that a long, shallow depression is formed. This is filled with the solution, which is cooled by air currents passing over its surface and by water sprays on the lower side of the belt. By the time the belt has gone the length of its travel the crystals have deposited out and are then drained free of solution as the belt moves over the pulley at the discharge end.

This same exhibitor had a small spray dryer in operation drying maltose syrup. It was evaporating about 2½ qt. of water per hour and occupied a space about 6 ft. by 10 ft. by 10 ft. high.

Seamless copper cylinders produced by an electrolytic deposition process were exhibited by Elmons Metal A.G. A cylinder 4 ft. in diameter, produced by this process, stood in one corner of the exhibit. The process is able to produce double-walled cylinders for heating or cooling rolls, which are entirely seamless. The corrugated inner shell is first formed and the corrugations are closed at the end. Having produced this inner shell, it is removed from the electrolyte and prepared to receive the cylindrical outer shell. It is then returned to the electrolyte and the outer cylinder is deposited. The bond between the inner and outer shell is claimed to be perfect, and this is readily believed since the joint could not be detected by visual inspection. The process seemed to work best on cylindrical shapes since all the articles exhibited or illustrated were cylindrical or spherical.

Continuous mercerizer shown in Hall IIIa



New Developments in the PLASTIC INDUSTRY

Supplements November, 1934, List of Plastic Products

This list of trade names was prepared by Alan F. Randolph of the Plastic Department of E. I. du Pont de Nemours & Co., Arlington, N. J., with the cooperation of Dr. Max Forrer, of Manufacture d'Isolants et Objets Moules, Vitry-sur-Seine, France, and of Dr. Frans Pabst, editor of *Plastische Massen*, Berlin-Dahlem, Germany. It supplements the list which appeared in *Chem. & Met.*, Vol. 41, pp. 589-596. The following symbols and abbreviations are used:

* Item appeared in 1934 list; this is correct or amplified information
C Casein
CA Cellulose acetate
Ellis, "The Chemistry of Synthetic Resins," by Carlton Ellis (Reinhold, N. Y., 1935)
f Fabricator's trade name, not necessarily same as trade name of material used
l Laminated goods PF Phenol formaldehyde UF Urea formaldehyde
m Molding compounds PX Pyroxylin x Sheets, rods, tubes
P Packaging material s Safety glass V Viscose
t Turnery material

Name	Description	Manufacturer or Reference
Aberol.....	PF.....	Resinous Products Co., Philadelphia
Abopon.....	Syn. res. water-sol.....	Glyco Products Co., New York
Abrac.....	Resin glyceride.....	Ellis 1382
Abron.....	Syn. wax.....	Boehme A. G., Chemnitz, Germany
Acephane.....	CA.....	Distillers' Co., Ltd., Edinburgh
Acronal.....	Vinyl.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Acryloid.....	Syn. res.....	Resinous Products and Chemical Co., Philadelphia
Acrysol.....	Aq. disp. of Acryloid.....	Philadelphian Celluloid Corp., New York
Acwalite.....	.....	Kalle & Co. A. G., Wiesbaden-Biebrich, Germany
Adulor.....	.....	Aero Research Ltd., Duxford, England
Aerolite.....	PF reinforced.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Aeternol.....	Syn. res.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Aflammit.....	.....	Ellis 1382
A. F. S.....	Aniline-formaldehyde-sulphur.....	A. G. für Elektrotechnik, Braunschweig, Germany
Age-rite.....	Aldolnaphthylamine.....	Atlas Ago Chem. Fabrik A. G., Leipzig
Agfenit.....	PF, m.....	American Cyanamid Co., New York
Ago.....	PX collars.....	Aladdin Corp., Newark, N. J.
Akco.....	PF.....	Dr. Kurt Albert G. m. b. H., Amöneburg, Germany
*Aladdinite.....	C.....	Säurechut G. m. b. H., Berlin
Alberto-lat.....	Alkyd res.....	E. K. Medical Gas Laboratories, Bloomfield, N. J.
Albert Pressfaser.....	.....	Alford & Alder Ltd., London
Aicphen.....	.....	Ellis 1383
Aldenol.....	PF denture.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Alforder.....	Syn. res.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Alkolite.....	Phenolphthalein resin.....	Kalle & Co. A. G., Wiesbaden-Biebrich, Germany
Alkydal.....	Alkyd res.....	Imperial Chemical Industries, Ltd., London
Alkydon.....	Syn. resin.....	Alusi Pressstoffwerk, Probstzella, Germany
Alkylin.....	.....	Resinous Products & Chemical Co., Philadelphia
Alloprene.....	Chlor. rubber.....	Dai Nippon Celluloid Co., Ltd., Osaka, Japan
Alusil.....	PF, m.....	Verenigte Isolatorenwerke A. G., Berlin
Amberlac.....	Syn. res.....	J. K. Goerler G. m. b. H., Berlin-Charlottenburg
Amberlite.....	Syn. res.....	Celluloid Corp., New York
*Amberol.....	PF, s.....	American Anode Inc., Wilmington, Del.
Ambloid.....	C.....	American Phenolic Corp., Chicago
Ambroid.....	C.....	Andrew McLean Co., New York
*Ambroin.....	PF, m & bituminous.....	Allgem. Elektrizitäts Ges., Berlin
Amenit.....	Polystyrene, m.....	Herbert Kurth, Schliffrstadt, Germany
Amergio.....	f.....	Allgem. Elektrizitäts Ges., Berlin
Amerite.....	Aq. dispersion syn. rubber.....	Callenders Cable and Construction Co., London
aminoplast.....	Generic term for urea-formaldehyde resins	Anchor Packing Co., Philadelphia
Amphenol.....	PF, f.....	
Andrulan.....	Resin-coated textiles.....	
Aniburit.....	Aniline res.....	
Anilit.....	Syn. res.....	
Anipal.....	Aniline res.....	
Anka.....	f.....	
Ankoprene.....	f Neoprene, q. v.....	

Name	Description	Manufacturer or Reference	Name	Description	Manufacturer or Reference
Aqualac.....	Shellac.....	Kasebier Chatfield Shellac Co., New York	Beckolbase.....	.....	Beck, Koller & Co., Inc., Detroit
Aqualite.....	PF.....	Nat. Vulcanised Fibre Co., Wilmington, Del.	Beckophen.....	Syn. res.....	
			Becrolit.....	CA, f.....		Kunststoffe 27 111 (1937)
Aquaplex....	Aq. dispersion alkyd resin..	Resinous Products & Chemical Co., Philadelphia	*Beetle.....	add l	Beekacite Kunstharzfabr. G. m. b. H., Wandsbek-Hamburg, Germany
			Bekolin.....	Syn. res.....	
Arbolite.....	Sheeting.....	N. V. Phillips' Gloeilampenfabrieken, Eindhoven, Netherlands	Bell.....	.....	Northern Industrial Chem. Co., Boston
Armourbex....	CA coated netting.....	British Xylonite Co., Ltd., London	*Belleroid...	Rubber plastic.....	Barrett & Eilers Ltd., London
			Bellerware....	f.....	
Artamur.....	PF 1, decorated....	Bakelite, Ltd., London	Benzex.....	Benzyl cell.....	British Xylonite Co., Ltd., London
Artmurex....	Asbestos	Dixie Ltd., London	Bernit.....	PF, m.....	Porsellanfabrik Bernhardschütte, Blechhammer, Germany
Asbedex.....	Pitch, asbestos, kieselguhr, l.	Chem. Zentralblatt 107 I 445 (1936)	Bewerit.....	PF, m.....	Beset-Werk H. Buchholz, Molsen, Germany
Asbopekollit.	PF etc., l.....	H. E. Ashdown Ltd., Birmingham, England	*BeX.....	PF, m, UF, m & f	British Xylonite Co., Ltd., London
			*Bezoid.....	CA, m, f, x.....	
Ashdown.....	PF etc., l.....	H. E. Ashdown Ltd., Birmingham, England	Beteg.....	PF, m, UF, m.....	Bayerische Elektrofabrik A. G., Nürnberg, Germany
Asplit.....	Acid-resistant cement, syn. res.....	Chem. Age 50 199 (1935)	Bilit.....	PF, m, UF, m.....	Busch-Jaeger Lüdenscheidler Metallwerke A. G., Lüdenscheid, Germany
Assurex.....	Tempered glass.....	Magnien Monnier & Cie, Paris	Billac.....	f.....	W. E. Ames & Co., Ltd., Sheffield, England
Asta.....	f.....	Permastic Ltd., Weybridge, Surrey, England	Bimolith.....	Resorcinol-trioxyethylene	Allgem. Elekt. Ges., Berlin
Astralon.....	Vinyl res.....	Celluloid Verkaufsges. G. m. b. H., Berlin	BJB.....	PF, m.....	Brückemann, Jaeger & Busse, Neheim, Germany
Ausco.....	.....	Carl Austin & Co., Ltd., Toronto	BkL board...	PF 1.....	Bousfields Ltd., London
*Australit...	Cold molded.....	Gebr. Adt A. G., Ennsheim (Saar), Germany	Bonalit.....	.....	L. Schröter, Schalksmühle, Germany
*Avecolite...	l.....	Wilmott Son & Phillips Ltd., London	Borron.....	Mica-filled syn. resin	Röhm u. Haas A.G. Darmstadt, Germany
AXF.....	Hydrocarbon plastic.....	U. S. Rubber Prods. Inc., Passaic, N. J.	Bowpre	.....	Bowley Preece & Co., Ltd., Birmingham
Azolon.....	PF.....	Soc. Belge de l'Azote, Ougrée, Belgium	Polychrome	PF 1.....	

B

Backitt.....	PF, m, UF, m.....	Otto Backhaus G. m. b. H., Oberbrügge, Germany	Bracolit.....	PF, m.....	Q. Branscheld & Co., Lüdenscheid, Germany
Backopress.....	PF, m.....	Gebr. Broghammer, Schramberg, Germany	Braunthite.....	PF.....	French patent 807746
*Bakelite.....	.....	add Soc. Ital. Resine, Milano	B. T. H.....	.....	British Thomson-Houston Co., Ltd., Rugby, England
Balance.....	Insulation.....	Belden Mfg. Co., Chicago	Buch-eronium.....	PF.....	Made at Köln-Ehrenfeld, Germany
Ballit.....	Plastic wood.....	I. G. Farbenindustrie, Uerdingen, Germany	Buffalo.....	f.....	De Jur Prods. Co., New York
*Barkalait.....	Pressure-cooked sawdust plastic.....	(U. S. S. R.) Plast. Massen 4 209 (1934)	Bulgin.....	f.....	A. F. Bulgin & Co., Ltd., Barking, Essex, England
Barnacle.....	m, f.....	E. W. Puckert Ltd., West Croydon, England	Buna.....	Syn. rubber.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
*Bebrit.....	PF, m, UF, m.....	Elektrotechnische Fabrik G. m. b. H., Bebra, Germany	Burg-waldharz.....	PF, m.....	Wilhelm Burgbacher, Neukirch, Germany
Beckasol.....	Alkyd.....	Beck, Koller & Co., Inc., Detroit	Bushboard.....	l.....	Bushing Co., Ltd., Hebburn-on-Tyne, England
Beckol.....	.....			
Becolate.....	.....	British Ebonite Co., Ltd., London			

Name	Description	Manufacturer or Reference
C		
Cahtyrit....	Acid-res. lining	St. Helen's Cable & Rubber Co., Slough, England
Calan.....	Molded	Porzellanfabrik Hesch, Hermsdorf, Germany
Calit.....	ceramics....	Elektro-Isolier-Industrie Wahn, Rheinland, Germany
Cambric....	PF, l.....	Campbell Fibre Co., Stanton, Delaware
Camphico.....		Dai Nippon Celluloid Co., Osaka, Japan
Campholoid..	PX.....	Electro-Isolier-Industrie Wahn, Rheinland, Germany
Canvass....	PF, l.....	Cincinnati Advertising Prods. Co., Cincinnati
Capcolite....	l.....	Carbogen Chem. Co., Garwood, N. J.
Carbasol....	Syn. res.....	(Same as Cuprene)....
Carben.....		Elektrotechnische Werke, Lönz, Basel, Switzerland
Carboloid....	PF.....	Dai Nippon Celluloid Co., Osaka, Japan
Cardolite....	Cashew oil polymer	Irvinton Varnish & Insulator Co., Irvington, N. J.
Cargan.....	Casein syn.....	Am. Dyest. Rep. 25 552 (1936)
Cargau.....	wool.....	Ind. Chim. 23 465 (1936)
Carlit.....	PF, m.....	Elektrotechnische Fabrik J. Carl G. m. b. H., Oberweimar, Germany
Carta Bakelit	PF, l.....	Isola-Werke A. G., Düren, Germany
Carta Textil	PF, l.....	
Cartax.....	PF, l.....	Fabricated Catalin, Inc., New York
*Catalin....	add l.....	C. A. Wurkhaus, Carthausen, Germany
Cawit.....	PF, m, UF, m.	
Cedra		
Interra....	Sheeting.....	New Prods. Digest 2 No. 785 (1926)
Cégécaps....	PF, f.....	
Cégécir....	Insulation....	Mfrs. d'Isolants et Objets Moulés, Vitry sur Seine, France
Cégécite....	PF.....	
Cégétez....	PF.....	
Cégévis....	PF, f.....	
Celafil.....		British Celanese, London
Celestafol....	V. p.....	Frankel's Foil & Film Machines, Ltd., London
Cellicover....	f.....	D. Smith & Sons Ltd., London
*Cellanite....	Aniline res. and fiber	Continental-Diamond Fibre Co., Newark, Del.
Celliass....	Cellulose, Asphalt.....	Zellstoff u. Papier 14 444 (1934)
*Cellion....	CA.....	Celluloid-Verkaufsst. G. m. b. H., Berlin
Cellulofol....	PX coating....	Sci. American 156 203 (1937)
Cellulak....		Continental-Diamond Fibre Co., Newark, Del.
*Celluloid....	PX.....	add Dermatoidwerke, Leipzig Rhein Gummi & Celluloidfabrik, Mannheim-Neckarau, Germany Dynamit A. G., Troisdorf, Germany
*Celluloide....	PX.....	Soc. Ital. della Celluloide, Castiglione-Cione, Italy Clyde Scott, East Orange, N. J.
Celluweld....	Films.....	Robert McARD & Co., Manchester, England
Celmac.....	f.....	British Celanese Ltd., London
Celric.....	CA.....	Acetate Prods. Corp., Ltd., London
Celvaloid....	CA on wood....	(U. S. S. R.) Chem. Zentr. 107 4653 (1936)
Cemalite....	Art. leather....	Celluloid Corp., New York
Charmour....	CA.....	Nippon Chisso Gunpowder Co., Ltd., Yokosuka, Japan
Chissoloid....	Px, no camphor	Chosen Sekitan Kogyo K. K., Osaka, Japan
Chisso-Rite..	PF, l.....	Ges. Chem. Industrie, Basel, Switz.
*Cibanit....	Aniline-formaldehyde, m. l.	British Celanese Ltd., London
Cinemoid....	CA (?).....	Fourco Glass Co., Clarksburg, W. Va.
Cinnamoid....	CA.....	Plastische Massen 7 114 (1937)
Clearlite....	Hardened glass.....	Gemold Corp., New York
Clematelt....	C. cement-asbestos	
Cloisonnette	Ornam. sheeting	
Clophen....	Chlorinated diphenyl	Angew. Chem. 49 917 (1936)
Co-dal.....	PF denture....	Coe Labs., Chicago
*Codite....		Continental-Diamond Fibre Co., Newark, Del.

Name	Description	Manufacturer or Reference
Collicetone..	CA.....	Collicetone Ltd., London
Colloresin....	Methyl cellulose....	Angew. Chem. 49 917 (1936)
Conite.....	Fiber prod....	Continental-Diamond Fibre Co., Newark, Del.
Coolicon....	PF, f.....	Benjamin Elect. Ltd., London
Co-oral-ite....	PF, denture....	Co-oral-ite Dental Mfg. Co., Los Angeles
Copalite....	Syn. res.....	Johannes Jeserich A. G., Berlin-Charlottenburg
Coralgrund....	Emulsion of polyacrylic esters.....	Plastische Massen 7 114 (1937)
Coralite....	PX denture....	N. Uhlen, Chicago
Corlit.....	C.....	J. Cornet, Barcelona
Corprene....	Syn. rubber with cork	Armstrong Cork Prods. Co., Lancaster, Pa.
*Crystalate..	f.....	Crystalate, London
Cristallex....	Benzyl vinyl res.....	Soc. Cristallex, Rheims, France
*Crystalloid..	Sheeting.....	Celluloid Corp., New York
*Cuprophane	Cupramm. film.....	Bemberg A. G., Wuppertal-Barmen, Germany
Cysalfa.....	Viscose wool imitation	Ind. Chim. 23 707 (1936)

D

Dagenite....	Bituminous....	Pritchett & Gold, London
Danofan....	CA.....	Danish Transp. Acetate Film Foil Works
Dartex.....	Chlorinated rubber....	Angew. Chem. 49 917 (1936)
Dayton resin	Petroleum resin	Dayton Syn. Chem. Co., Dayton, Ohio
Deccabond....	l.....	Bushboard Co., Ltd., Newcastle-on-Tyne, England
Decelith....	Vinyl res.....	Deutsche Zelluloid Fabrik, Eilenburg, Germany
Decora.....	Syn. res. with casein, m. f.	Universal Metal Prods., Ltd., Lancaster, England
Dellite.....	l.....	Fabr. Suisse d'Isolants, Breitenbach, Switz.
Dependoid....	f.....	English Needle & Fishing Tackle Co., Ltd., Birmingham, England
Dermatine....	See Fiber Diamond	
Dessavia....	PF, l.....	Neolitwerke G. m. b. H., Dessau, Germany
Detel.....	Chlorinated rubber....	Detel Prods. Co., London
Deverr.....	Syn. res.....	Kredl Heller & Co., Wien
Dexine.....		Dexine Ltd., London
Dexonite....		
Diakon.....	Methacrylate resin m.....	Imperial Chemical Industries, Ltd., London
Dilophane....	l.....	Soc. Nobel Francaise, Paris
Dinophene....	PF, m, s.....	Continental Diamond Fibre Co., Newark, Del.
Dinophene....	PF, m, s.....	Scott, Bader & Co., London
Domolac....	CA.....	
Dorcamware f		Doream, Ltd., Birmingham, England
Doverite....		Dover Ltd., Northampton, England
Dowal.....	PF, m.....	Wacker & Doerr, Niederramstadt, Germany
Drawinol....		Dr. Alex Wacker Ges., München
Drawolose....		
Drybak.....	PF, coated cloth.....	Johnson & Johnson, New Brunswick, N. J.
Du Gris.....	Neoprene, f.....	E. M. Smith Co., Los Angeles
Duralit.....	PF, m.....	Schulze, Schneider & Dort, Schörring, Germany
Duralite....	f.....	Dura Co., Handforth, Cheshire, England
Duraloy....	Plastic sheet..	Detroit Paper Products Corp., Detroit
Duramet....	Impreg. fiber....	Dr. K. Albert G. m. b. H., Wiesbaden-Biebrich, Germany
Durangus....	l.....	Geo. Angus & Co., Ltd., Newcastle-on-Tyne, England
Duranit....	PF, m.....	O. Langmann, Hagen, Westf., Germany
Duraplex....	Alkyd.....	Resinous Prods. & Chem. Co., Philadelphia
Durat.....	See Fiber Diamond	
Duratone....	PF, denture....	Iteco Labs., Inc., Portland, Oregon
*Durax.....	PF, m.....	Isola Werke A. G., Birkesdorf-Düren, Germany

Name	Description	Manufacturer or Reference
Durit.....	Shellac subst..	Robt. Rath Inc., Newark, N. J.
Duroid.....	CA.....	Duroid Covering Co., Ltd., Manchester, England
*Duro Kerit. f		Plastica G. m. b. H., Berlin
*Duropfen....	m.....	Dr. Kurt Albert G. m. b. H., Wiesbaden-Biebrich, Germany
Duroprene....	Chlorinated rubber.....	A. H. Davis, Ltd., Liverpool
Duxalkyd....		L. Blumer, Zwickau, Germany
Dynos.....	Vulcanized fiber.....	
Dytron.....	l.....	Venditor G. m. b. H., Troisdorf, Germany
Dytron-Lignofol	l.....	

E

Ebona		
Special....	Neoprene, f.....	Republic Rubber Co., Youngstown, Ohio
Ebrok.....	Bituminous....	Richardson Co., Melrose Park, Ill.
ECA.....	C.....	Brüggemann & Cia., Mexico D. F.
Ecarlit.....	CA.....	Celluloidfabrik Speyer, Speyer, Germany
Efkalit.....	PF, m.....	Frankl & Kirchner G. m. b. H., Mannheim, Germany
Ejsopan....	PF, m, UF, m.	Ernst Jaeger & Co., Schalksmühle, Germany
Elerit.....	PF, m.....	Erich Jaeger G. m. b. H., Bad Homburg, Germany
Elgesit.....	PF, m, UF, m.	Ellinger & Geissler, Dordain, Germany
Eliasit.....	PF, m.....	J. Elias, Praha, Czechoslovakia
Eliabec....	C, f.....	London Assn. for Blind, London
Elison.....		Elle 1393
Emadolit....	PF, m.....	Emil Adolf A. G., Reutlingen, Germany
Empire.....	Insulation....	Mica Insulator Co., New York
Enameloid....		Gemold Corp., New York
Enduraloid....	f.....	H. M. Smith, London
EPO.....	f.....	Ecote Nat. des Matieres Plastiques, Oyonnax, France
Ergelit.....	PF, m.....	Rich. Giersleben, Bergisch Born, Germany
Erinol.....	PF.....	Erinold Ltd., Stroud, England
Escolite....	Plastic ribbon for illuminated signs	American Edgways Sign Co., Detroit
Estelit.....	PF, m.....	Storeh & Stehmann G. m. b. H., Ruhl, Thür., Germany
Esterol.....	Alkyd resin....	Paramet Chem. Corp., New York
Ethocel.....	Ethyl cellulose.....	Dorr Co., New York
Everlite....	f.....	Evered & Co., Ltd., Smethwick, England
Excellite....		Vynckier Freres & Cie., Ghent, Belgium
Exceloid....		Excelsoid Co., Ltd., Litchfield, Staff., England

F

*Fabrolit....	PF, m; also inorganic	Plastische Massen 7 114 (1937)
*Fabrolite....	PF, m.....	British Thomson-Houston Co., Ltd., London
Fano.....		Kalle & Co., Wiesbaden, Germany
Faolit.....	PF.....	Kunststoffe 25 261 (1935)
Faolite.....	PF, abestos....	Chem. Abst. 29 3069 (1935)
*Faturan....	PF, m.....	New York Hamburger Gummiwaren Fabrik, Hamburg
*Fermit.....	Cement-asbestos	Plastische Massen 7 114 (1937)
*Fermit.....	Cold molted..	Isola Werke A. G., Birkesdorf-Düren, Germany
Ferrisol....	Polystyrene with metal powder	I. G. Farbenindustrie, Frankfurt am Main, Germany
*Fiber Diamond	PF, l.....	La Plaine St. Denis, Seine, France
Fibrallite....	PF, m.....	Montecatini, Milano, Italy
Fibresinol....	PF, m.....	Dr. F. Raschig G. m. b. H., Ludwigshafen, Germany
Fibro.....	f.....	John Walter & Sons Ltd., Kitchener, Ontario
McLeod & McLeod		
Fibroc.....	PF, l, f.....	London
Fibrodent....	CA, Pz.....	Fibro Insulation Co., Valparaiso, Indiana
Fibrold Corp.		
Fibros.....	PF.....	Fiberold Corp., Indian Orchard, Mass. (U. S. A.), Ellis 1394
Filaatic.....	Latex-impreg. textile.....	Soc. Internat. de Fils Elastiques, Paris

Name	Description	Manufacturer or Reference
*Flaka.....	Methyl cellulose bottle caps.....	Kalle & Co., Wiesbaden-Biebrich, Germany
Flamenol.....	Vinyl chloride resin.....	General Electric Co., Schenectady, N. Y.
Flexbestos.....	Syn. res. with asbestos.....	H. Trist & Co., Bristol, England
Flotabit.....	Resins.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Flotavin.....	Resins.....	Montecatini, Milano, Italy
Fluorite.....	PF, m.....	Ioso Rubber and Waterproofing Co., Ltd., Glasgow
Formapex.....	PF.....	New York Hamburger Gummiwaren Fabrik, Hamburg
*Formapex.....	PF, l.....	Lembach & Schleichner, G. m. b. H., Wiesbaden, Germany
Miocarta.....	PF, l.....	Stockhardt & Schmidt-Eckert, Kronach-Oberfranken, Germany
Formolit.....	PF, m.....	Nobel Chem. Finishes Ltd., London
Framalite.....	PF (?) s.....	Friemann & Wolf G. m. b. H., Zwickau, Germany
Frankit.....	PF, m.....	Cable Mfg. Co., Bratislava, Czechoslovakia
FreteX.....	.....	Kabelgyar Reszvenytarsasag, Budapest
Friwocit.....	PF, m.....	.....
Futan Futon f.....	.....	.....
*Futurit.....	PF, m.....	.....

G

*Galalith.....	C.....	add Galalith Ltd., London
Gardlite.....	toluene-sulphonamide resin	.....
Geaphan.....	CA.....	Allsem, Elektr. Ges., Berlin
Gercut.....	CA & PX scrap	Larry Gering, Newark, N. J.
*Germalith.....	PF, m.....	Carl Germer, Berlin-Charlottenburg, Germany
Gesanit.....	PF, m.....	Gebr. Spindler, Köppelsdorf, Germany
Gingivist.....	Denture	.....
Glutofix.....	Methyl cell.	.....
Glutolin.....	Methyl cell.	Angew. Chem. 49 917 (1936)
Glycol.....	.....	C. F. Boehringer & Söhne G. m. b. H., Mannheim-Waldhof, Germany
Glycene.....	Alkyd denture	Bakelite Corp., New York
Glycol Borol-Borate.....	Water-soluble res.	Glyco Prods. Co., Inc., New York
Glycophene.....	Syn. res.	Établ. Kuhlmann, Paris
Graconit.....	PF, m.....	Graewe & Co., Menden, Westf., Germany
Graphic Lamicoide.....	l.....	Mica Insulator Co., New York
Grelf-Faturan.....	.....	New York Hamburger Gummiwaren Fabrik, Hamburg
Grellit.....	f.....	Grohnmann Fleischmann & Co., Nixdorf, Czechoslovakia
*Gummon.....	add	Garfield, N. J.
Guttaroid.....	Insulation.....	Kabelgyar Reszvenytarsasag, Budapest
		W. T. Glover & Co., Ltd., Manchester, England

H

Haberit.....	PF, m.....	Bender & Wirth, Kierspe-Bahnhof, Germany
Hacolit.....	PF, m.....	Westdeutsche Metallind. G. m. b. H., Unna-Westfalen, Germany
Hadura.....	CA, etc., f.....	Hadley Co., Ltd., Surbiton, Surrey, England
Hafo.....	Gelatin film.....	Rev. Prod. Chim. 38 577 (1935)
Hagonym.....	.....	Hageda, Berlin
Hakalit.....	PF, m.....	Krieger & Faudt, Berlin
Harvite.....	UF, m, f.....	Siemon Co., Bridgeport, Conn.
*Hecolite.....	PX denture.....	add American Hecolite Denture Corp.
Heda.....	f.....	Rhein. Gummi- & Zellulosefabrik, Mannheim-Neckerau, Germany
Hefrolin.....	.....	Hesmann Frenkel, Mikau b. Leipzig
*Heliosit.....	Bituminous.....	H. Römmler A. G., Spremberg, Germany
Heliowatt.....	PF, cold-molded and misc.	Heliowatt Werke, Berlin-Charlottenburg, Germany
Heliolith.....	.....	H. Kurth, Speyer, Germany

Name	Description	Manufacturer or Reference
Hellardid.....	PX, etc.....	Kalle & Co., Wiesbaden-Biebrich, Germany
*Hemit.....	Cold-molded.....	Garfield Mfg. Co., Garfield, N. J.
Henrite.....	PF, f.....	Henrite Prods. Co., Inc., Ironton, Ohio
Herbolit.....	PF, m.....	H. Bodenmüller, Stuttgart-Zuffenhausen, Germany
Hercose C.....	Cell. acetate butyrate.....	Hercules Powder Co., Wilmington, Del.
Heresite.....	Syn. res. m.....	Heresite & Chemical Co., Manitowoc, Wis.
Heroprene.....	Neoprene f.....	Hewitt Rubber Co., Buffalo, N. Y.
Hivoltait.....	f.....	Standard Insulator Co., Ltd., London
Hochvolt.....	PF, l.....	A. G. für Hochvoltisolierung, Dresden
Hocolit.....	PF, m.....	Hochkopper & Co., Lüdenscheid, Germany
Hofa.....	V.....	Kunstseide 18 114 (1936)
Holite.....	Printing plate.....	Holite Press, London
Hurlinite.....	Coated netting.....	Shrimpton-Hurlin Ltd., London
H. V.....	l.....	McLeod & McLeod, London
Hydrhoplex.....	Resin emulsion.....	Röhm & Haas Co., Philadelphia
Hydroresin.....	Syn. res.....	Glyco Prods. Co., Inc., New York
Hygienit.....	f.....	Kabelgyar Reszvenytarsasag, Budapest
Hyrax.....	Syn. res.....	(U.S.A.) Rev. gén. mat. plastiques 12 47 (1936)

I

*Idealith.....	C.....	J. N. Bolkart, Nürnberg, Germany
Idonit.....	PF.....	Bakelit Ges., Berlin
Iganil.....	Resin.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Igas.....	Asphalt comp.	K. Winkler & Co., Zurich-Alstetten, Switzerland
Igelit.....	Vinyl, resins, m. s.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Igeloid.....	.....	.....
Iglate II.....	.....	.....
I. G. Wachse.....	Esters of montanic acid.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Ikilith.....	C.....	W. Mantz & Co., London
Imperit.....	PF, m.....	Kaiser & Spelsberg, Schalksmühle, Germany
Impermo.....	PF, f.....	P. L. Stoffel, Arbon, Switzerland
*Indur.....	Syn. res.....	add Relly Tar and Chem. Corp., New York
Insulber.....	CA film.....	British Xylonite Co., Ltd., London
Insulite.....	Wood fiber board.....	Insulation Mfg. Co., Brooklyn, N. Y.
*Insurok.....	PF, l.....	Richardson Co., Melrose Park, Ill.
Isodurit.....	f.....	Setelik & Spol. Praha, Czechoslovakia
Isolierpanzer.....	PF.....	Gebr. Berker, Schalksmühle, Germany
*Isolierstahl.....	PF, m, UF, m.....	Dr. Delsting & Co., G. m. b. H., Kierspe, Germany
Isolierstoffe.....	S & K.....	E. Backhaus & Co., Kierspe, Germany
Isolit.....	.....	Skanska Attifabriken A. B., Fersörp, Sweden
Isophan.....	Articles from latex.....	Kunststoffe 26 211 (1936)
Isorel.....	"Syn. wood".....	(France) Brit. Plastics 3 312 (1936)
Isowar.....	PF, m.....	Hildebrand & Hamerschmidt, Brand-Erbisdorf, Germany
*Issolin.....	PF.....	Klasing & Dettmers, Isolin, Dresden
Iayntha.....	Vinyl resin.....	Electro-Isolier G. m. b. H., Berlin-Adlersdorf, Germany
*Iteco.....	PF denture.....	Iteco Co., Portland, Oregon
*Ivoris.....	f.....	French Ivory Prods. Ltd., Toronto
*Ivryne.....	C.....	A. Feuillant Fils, Ivry la Bataille, France

J-K

Jaroplast.....	Res. m.....	Jaroslav, Berlin
Jaroplast.....	PF.....	Weissensee, Germany
Jespa ware.....	UF.....	J. S. P. Products, Ltd.
J. S. P.....	PF, f, UF, f.....	J. S. P. Products, Ltd.
Juralit.....	PF, f.....	J. Schreiber & Co., Lipnik, Czechoslovakia
Juvenoid.....	Misc.....	Raphael H. Ltd., London
*Kabelit.....	.....	Továrna na kable, a. s. Bratislava-Kolín, Praha, Czechoslovakia

Name	Description	Manufacturer or Reference
Kalanite.....	Bituminous compd.....	Callender's Cable & Const. Co., Ltd., London
Karboid.....	PF, m.....	Das Nippon Celluloid Co., Osaka, Japan
Kasinoid.....	C, f.....	Kasinoid Ltd., Bexley, Kent, England
Katro.....	Px, etc.....	Kalle & Co., Wiesbaden-Biebrich, Germany
Kaurit.....	UF, s.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Kaurit-Schaum.....	Insulation.....	.....
Kawelit.....	PF, m.....	K. Wegner, Berlin
Kaynite.....	m.....	Waterbury Button Co., Waterbury, Conn.
Kelsanite.....	.....	Ind. Finishes 11 51 (1935)
Kiri.....	Shellac residue.....	Brit. Plastics 6 148 (1934)
Kiwitan.....	PF, m & cold-molded.....	Wolff & Co., Walsrode, Germany
Kleinlit.....	PF, m.....	Julius Klein Nachf., Coburg, Germany
*K.M. resin.....	.....	J. M. Steel & Co., Ltd., London
*KM.....	Alkyd.....	Advance Solvents & Chem. Corp., New York
Korogel.....	Koroseal in jelly form.....	.....
Korolac.....	Sol. of Koroseal.....	B. F. Goodrich Co., Akron, Ohio
Koroseal.....	Polyvinyl chloride.....	.....
KP.....	PF, m.....	Karl Potthoff, Solingen-Ohligs, Germany
Kurilac.....	Shellac subst.....	E. I. du Pont de Nemours & Co., Wilmington, Del.

L

Lacrinoid.....	C, f.....	Lacrinoid Prods. Ltd., London
Lactex.....	Coated fabrics.....	L. E. Carpenter & Co., Newark, N. J.
Lactecol.....	Plastic from latex.....	Plastische Massen 7 119 (1937)
Lactorn.....	C.....	British Xylonite Co., Ltd., London
Lactron.....	Latex thread.....	Revere Rubber Co., National Vulcanized Fibre Co., Wilmington, Del.
Laminar.....	.....	.....
Laminite.....	.....	Old King Cole, Inc., Canton, Ohio
Lanital.....	Casein fiber.....	Soc. anon. Sula-Vicosa, Torino, Italy
Lanusa.....	Imit. wool.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Lautlos.....	Silent gears.....	F. Oswald, Chemnitz, Germany
Lauxite.....	UF with zinc chloride.....	I. F. Lauxes Inc., Seattle, Wash.
Lauxrez.....	Syn. res.....	.....
Lederstein.....	Vulc. fiber.....	Vulkanfaserfabrik Martin Schmid, Werden, Berlin
Lektrik.....	f.....	A. P. Lundberg & Sons, Ltd., London
Leskoform.....	.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Leukon.....	See Diakon and Perspex.....	.....
Leyconit.....	PF, m.....	Leyhausen & Co., Nürnberg, Germany
Licolit.....	PF, m, UF, m.....	Lindner & Co., Jechas-Sondershausen, Germany
Lignofol.....	PF, impreg. wood.....	Venditor G. m. b. H., Troidorf, Germany
Lignoform.....	Superseded by Ballit.....	.....
Lignose.....	f.....	Lignose G. m. b. H., Berlin
*Linax.....	PF, l.....	Siemens Schuckert Werke, Berlin
Linolit.....	PF, m.....	Linden & Co., G. m. b. H., Lüdenscheid, Germany
Lionite.....	.....	Lionite Insulation Co., Brooklyn, N. Y.
Litholite.....	s, f.....	Litholite Insulators & St. Albans Mouldings Ltd., Watford, England
Lonzatub.....	CA drinking tubes.....	Lonsa-Werke, Waldshut, Germany
*Lucite.....	Methyl methacrylate resin, m, f.....	E. I. du Pont de Nemours & Co., Arlington, N. J.
Lumalite.....	Syn. res.....	Imperial Molded Prods. Corp., Chicago
*Lumarith.....	CA, m, f.....	Celluloid Corp., Newark, N. J.
Lumeware.....	CA, f.....	Lumeware Ltd., Bournemouth, England
Lundberg.....	.....	A. P. Lundberg & Sons, Ltd., London
Lupolit.....	.....	I. G. Farbenindustrie, Frankfurt am Main, Germany
Lusynon.....	.....	.....
Lutonal.....	Vinyl resin.....	Venditor G. m. b. H., Troidorf, Germany
Luvipren.....	.....	I. G. Farbenindustrie, Frankfurt am Main, Germany

This compilation will be concluded in the September issue of Chem. & Met.—Editor.

Industry, Science and Labor Representatives Explore Silicosis Prevention

Owing to frequent misunderstandings in regard to silicosis, attendants at a preliminary meeting called in Washington by the Secretary of Labor in February, 1936, decided on a conference procedure as a practical approach to the problem. A larger group, meeting in April of that year, suggested the appointment of four committees to carry out detailed investigations and make recommendations for silicosis control. One committee was interested in the prevention of silicosis through medical control, another through engineering control; the third considered economic, legal and insurance phases of the problem; while the last took up regulatory and administrative phases. After numerous conferences, these committees finally met in joint session in February, 1937. Recently a bulletin summarizing the reports submitted at the conference was released by the U. S. Department of Labor. Later publication of the full reports is probable.

What follows summarizes this summary. For more complete information, readers are referred to Bulletin No. 13 of the U. S. Department of Labor, Division of Labor Standards—Editor.

SILICOSIS is a chronic disease due to the breathing of air containing silica, characterized anatomically by generalized fibrotic changes and the development of miliary nodulation of both lungs, and clinically, by shortness of breath, decreased chest expansion, lessened capacity for work, absence of fever, increased susceptibility to tuberculosis (some or all of which may be present), and by characteristic roentgenological findings. In other words, silicosis is a disease of the lungs in which the normal lung tissue is replaced by fibrous or scar tissue caused by breathing air containing silica dust. A definite diagnosis of silicosis cannot be made until there is evidence of the development of miliary nodulation in both lungs.

Clinical and laboratory studies have indicated that the harm produced by silica inhaled is primarily the result of chemical action, in addition to possible mechanical effects of the silica on the lung tissue. It has also been demonstrated that the concentration of free silica in the inspired air, the sizes of silica particles, the length of time the individual is exposed, and, to an undetermined extent, the concentration, composition and size of other constituents of the atmospheric dust, all are determining factors in the amount of nodular fibrosis in the lungs that is produced. Exposure to low concentrations of free silica may sometimes be continued more than 30 years before the condition develops to a stage where it can be diagnosed as silicosis. A great majority of the cases of silicosis it seems, however, have had exposures of at least 7 years.

Although it appears that there can be no universal regulatory standard of permissible dust concentration at the present time, there is evidence that for prolonged exposure, a concentration of more than 5,000,000 particles per cubic foot of a highly siliceous dust is dan-

gerous. Therefore, it is now considered good practice to hold concentrations of such dust to 5,000,000 particles per cubic foot or less. As a tentative standard of good practice, it is recommended that the percentage of free silica in the dust be multiplied by the total particle dust count, obtained by the method discussed in the United States Public Health Service Reprint No. 1520. If the result is under 5,000,000 the condition may be considered permissible. This formula is not applicable to any dust containing less than 5 per cent free silica.

Silicosis often induces tuberculosis and it is usually the tuberculosis which disables and kills the silicotic individual. However, the presence of silicosis does not necessarily mean even partial disability. Out of 2,711 silicotic men examined, 23 per cent were diagnosed as anthracosilicotic. Of these, 63.4 per cent showed evidence of physical defects decreasing capacity for work, but only 20.9 per cent had moderate or marked disability. Of the remaining men without anthracosilicosis, only 9.7 per cent showed evidence of physical defects decreasing capacity for work, and only 1.7 per cent of these defects were sufficient to impair working capacity.

Engineering Control Committee

This committee pointed out that the first step toward prevention and control of silicosis should be taken when a new plant building program is contemplated, or existing plants are remodeled or renovated. Thus, the effect on the surrounding neighborhood of operating a plant involving dusty operations should be considered. Structures housing activities creating a dust hazard should be designed to facilitate dust control. For instance, projections, ledges and resting places for dust and dirt should be eliminated or minimized. Building interiors should be so designed that they may be easily cleaned by such methods as washing or hosing down, vacuum cleaning or brushing.

Where there may be a considerable spillage of dusty material on the floor, operations are sometimes located over gratings, beneath which is equipment for handling the material that falls through. A useful control method is to locate passageways so that the least number of people possible will be compelled to travel in the more dusty plant zones.

Natural ventilation should usually be considered only as an adjunct in removing or reducing dust in the air for it cannot be relied upon at all times and should never be relied upon when a mechanically operated system is necessary to provide adequate protection. Dusty material should be stored in dust-tight inclosures, provided with a breather or vent stack to permit the air displaced during loading to be carried outside the building. If the air is extremely dusty, an exhaust fan should be connected to the vent stack. Mechanical materials handling equipment often should be housed and provided with an exhaust system.

Processes that produce a great deal of dust are best isolated from the rest of the plant. Wherever possible, dust-producing units should be grouped together to permit a more compact and efficient exhaust system installation. Furthermore, adequate attention must be given to the provision of dust arresters to prevent hazardous dust from being circulated into other parts of the plant or into the neighborhood.

Good housekeeping in the plant is unquestionably the cheapest single method of dust control. If possible, the use of water under pressure is recommended for cleaning the interior of buildings. Or water may be combined with air. The air pressure provides sufficient force to dislodge the dust while the water aids in settling it. Vacuum cleaning has the advantage of removing the dust without dispersing it into the atmosphere. Older types of buildings are particularly suited to brush cleaning. Low pressure steam can sometimes be used to advantage. All cleaning should be done if possible outside of working hours and the men engaged in this operation provided with dust respirators in accordance with recommended practice.

Ventilation and Respiratory Devices

Design of ventilation systems has been discussed in considerable detail for a number of applications in "Industrial Dust," by Drinker and Hatch, McGraw-Hill Book Co., New York, 1936; and in U. S. Public Health Bulletin 217, 1935. Exhaust piping size varies with the characteristics of the dust but in general velocities of not less than 2,000 c.f.m. should be used. A fair average found in dust-collecting systems is from 3,500 to 5,000 c.f.m. Customarily, the dust-collecting system discharges to a primary dust separator for removal of the larger particles by centrifugal force, then to a secondary separator which relies on filtration, wet collection, electrical precipitation or dynamic precipitation.

It is generally agreed that in the control of exposure to dust, primary consideration should be given to procedures preventing a harmful degree of contamination of the air of the breathing zone. However, there will always be situations where these procedures will be inapplicable, impractical, or not adequately effective. For these situations, respirators are required to give protection, either as a primary means or as an adjunct to other dust prevention procedures. The type most commonly used is the mechanical filter respirator. This equipment must give adequate protection, reasonable comfort and an accepted service life period of protection. Another type, the supplied air respirator, includes the air-line type, the hose mask and the abrasive blasting respirator. When air is supplied from a compressed air line, care must be taken that no objectionable or harmful substance is present in the air supply. Air purifying units are available for use in removing oil and water mist, odors, dirt, scale and dust in air supplied to such respirators.

Keeping respirators on the men when they are exposed to non-irritating but harmful dust is a problem which can be solved only by proper education. Personal respiratory protective devices must be maintained in good condition and where a considerable number are used, it is good practice to have a "respirator room" with an attendant who issues the respirators, cleans, sterilizes and otherwise keeps them in good condition.

Other Committee Reports

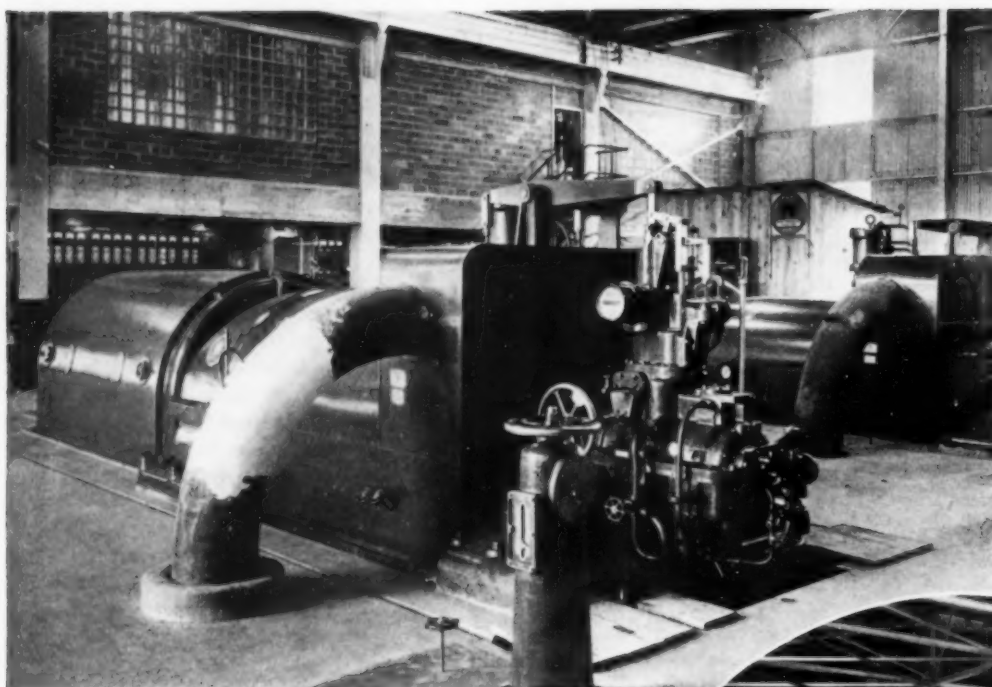
It has been estimated by the United States Public Health Service that approximately 4,000,000 workers are exposed to the inhalation of non-metallic mineral dust. Perhaps 1,000,000 are exposed to silica dust in American industry. Of these it is estimated that one-half are exposed to silica dust to a harmful degree. Approximately 110,000 workers now employed are stated to have silicosis in some degree, but of that number of workers probably not over 4,000 to 5,000 suffer any work disablement at this time. A percentage of the group of 4,000 to 5,000 workers who are now partially or completely disabled has tuberculosis and for them the problem of what to do is a serious one. There seems to be no doubt in anyone's mind that these workers should be removed from employment and compensated for total disability just as if they had been incapacitated by accidental injury.

In the case of the remainder of this group of 4,000 to 5,000 workers, who have silicosis but no tuberculosis, and not in a disabling degree, some may perhaps be transferred advantageously to other employment, but many may be continued at their regular occupations if known methods are applied to control the dust and if special care is employed to prevent the development of tuberculosis or other lung complications. To the 105,000 workers who have silicosis but no disability and no tuberculosis, the problem is not particularly serious. If dust is properly controlled, such men should be permitted to continue at their regular occupations. And for the 900,000 workers who are exposed to silica dust and do not have silicosis, all emphasis should be placed upon the application of known methods of controlling and, so far as possible, preventing dust formation.

Legal Aspects

Although the primary solution of the silicosis problem is prevention, the fact must be recognized that workers who have the disease, as well as those who may contract it, must be compensated just as are those workers who are injured in accidents. Accordingly, the conference agreed unanimously in recommending that there should be coverage for silicosis in the compensation acts of all states. This coverage should be compulsory. Owing to competition between states, laws and regulations of the several states should be as uniform as practicable. Employers should insure their obligations for compensation either through self-insurance or with an authorized insurance institution.

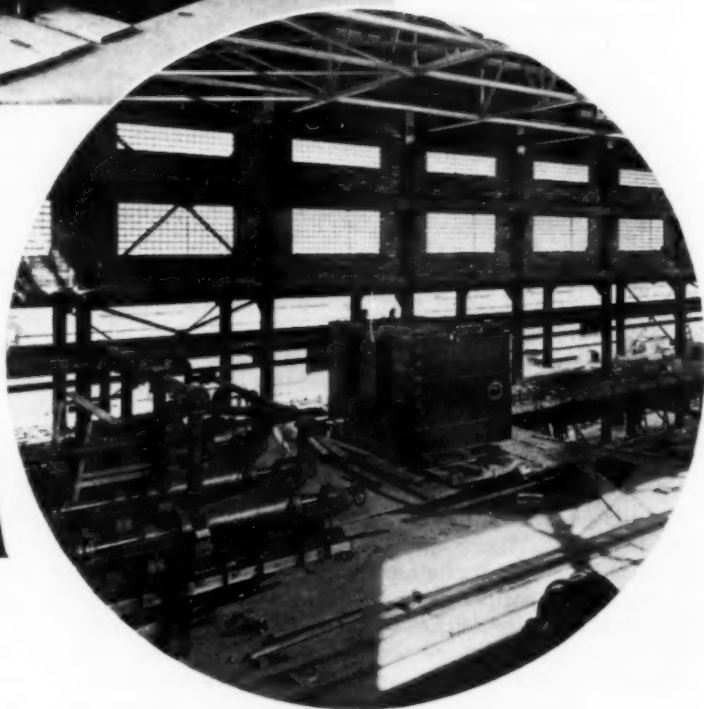
Because expert medical advice is necessary in determining disability in silicosis cases a medical advisory board of examiners and experts on silicosis should be established as an official impartial body in each state, according to Conference opinions. Each state should have a bureau of occupational hygiene and a bureau of inspection which should cooperate closely in the making of health surveys, conducting of plant studies and the carrying on of necessary research and inspection. Furthermore, federal legislation should provide more adequate appropriations to the appropriate governmental agencies to permit these agencies to continue and expand their research and study of the medical, engineering, economic, legal and insurance phases of the silicosis problem.



Glass blocks supplant windows in power house and machine room. They diffuse sunlight, and eliminate corrosion difficulties of iron and steel window frames and rapid deterioration of wooden frames due to high humidity conditions in machine room

WEST VIRGINIA in SOUTH CAROLINA

By JAMES A. LEE
MANAGING EDITOR OF CHEM. & MET.



WHILE the 12 to 15 kraft mills that are under construction or have been completed in recent months in the Southern States are quite similar in design, each mill has certain features that make it different from any one of the others. It is true of the North Charleston, S. C., kraft mill of the West Virginia Pulp and Paper Co. This mill has the largest single tonnage machine for the production of paper or board products as yet installed anywhere in the world. A water supply of from 25,000,000 to 35,000,000 gal. a day is brought to the plant through the 34 mile long Edisto River-Goose Creek Tunnel, which is a unique engineering project. Among the other features of this mill should be mentioned the use of glass blocks in place of window glass in the machine room and power house, and the semi-continuous causticizing system.

The new unbleached kraft mill of the West Virginia corporation is located in a suburb, ten miles from the center of historical Charleston. It is on the Cooper River, at a point about 17 miles from the open ocean. The splendid harbor accommodates vessels up to 30 ft. draft. Several ocean steamship lines and three railroad systems serve the pulp mill.

The mill has been designed for an initial capacity of 500 tons of unbleached kraft pulp and 400 tons of container board per day. One unit has been completed and others may be added at some future time. The company has been accumulating timber lands in both North and South Carolina for approximately 15 years.

The buildings for the most part are steel frame with Robertson corrugated protected metal side walls. The walls of the machine room and power house are glazed

tile and glass blocks. Over 16,000 of these glass blocks were used to supplant windows. The hollow blocks are 8 in. square and 4 in. thick. They diffuse the sunlight and permit about 85 to 90 per cent light penetration. Their use eliminates the corrosion difficulties of iron and steel window frame and the rapid deterioration of wooden frames due to the very high humidity condition in the machine room. This interesting installation of glass blocks is shown in accompanying illustrations.

The company arranged with the city of Charleston to deliver a minimum of 25,000,000 gal. of water a day for which it agreed to pay a yearly rental of approximately \$30,000. Provision was made for an increase in quantity of water in the future should the demands of the mill increase.

In order to supply this large volume of water the city built the Edisto River-Goose Creek Tunnel which due to its unique engineering construction, conceived by J. E. Gibson, City Engineer of Charleston, has attracted wide attention and has been visited by many engineers. The tunnel was bored through marl which is somewhat softer than rock but is hard and strong enough not to require support or lining. The entire tunnel extends through this unusual formation at a depth of between 20 ft. and 72 ft. below the surface. It is below sea level throughout the entire length.

The intake of the river is at an elevation of 26 ft. and the full-water pool level of the Goose Creek Reservoir, into which the tunnel discharges, is at an elevation of 7. This 19 ft. drop provides a gravity flow capacity of 50,000,000 gal. daily. By installing pumps with a suction lift to permit the raising of water from an elevation

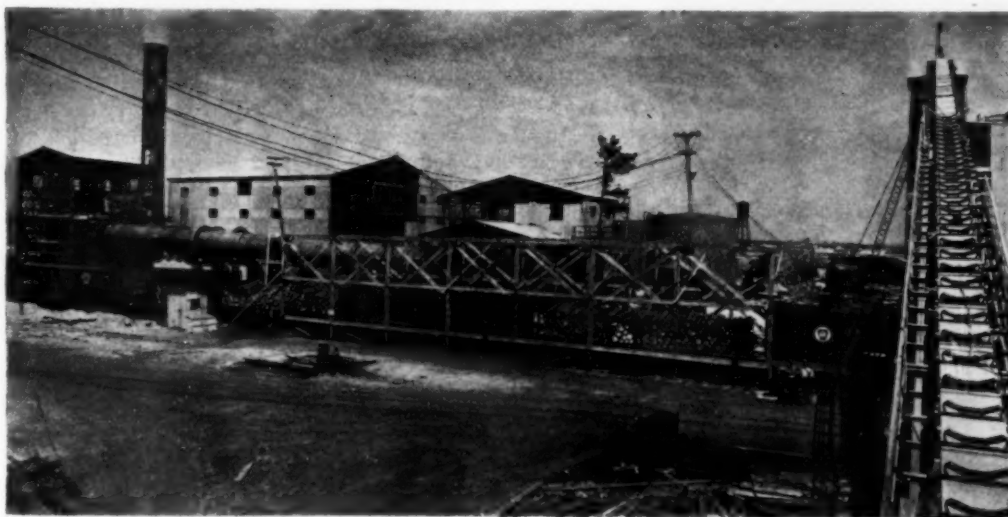
—13, it will be possible to increase the capacity to 80,000,000. The minimum flow of the Edisto River is approximately 150,000,000 gal. per day or about double the maximum volume of water which the tunnel will divert when operated at full pumping capacity.

From the Goose Creek Reservoir the water will be delivered through about 18,000 ft. of lock joint pipe to a reservoir at a sufficient elevation to assure a head of 40 ft. At the paper mill there is a 750,000 gal. reservoir and a pumping station with a 50,000,000 gal. daily capacity.

The water is free from turbidity and is very soft, its hardness being only about 10 parts per million. The full course of treatment provides for coagulation, with alum and sodium aluminate, aeration and filtration. The engineering in connection with this water supply development for the West Virginia organization was handled by Malcolm Prinie of New York. For a detailed description of this interesting project see *Compressed Gas Magazine*, Vol. 42, p. 5294, 1937.

The lime used in causticizing the green liquor in the preparation of the cooking liquor for the chips is treated in two kilns. Each kiln is 8 ft. 6 in. in diameter and 170 ft. in length. They are oil fired, and equipped with drag chains in the final 20 ft. These chains break the lumps of lime mud and reduce the lime dust loss. They are also provided with motor driven fans which are used only on special occasions. The temperature of the charging end of the kilns is about 900 deg. F. and at the other end is 2,300 deg.

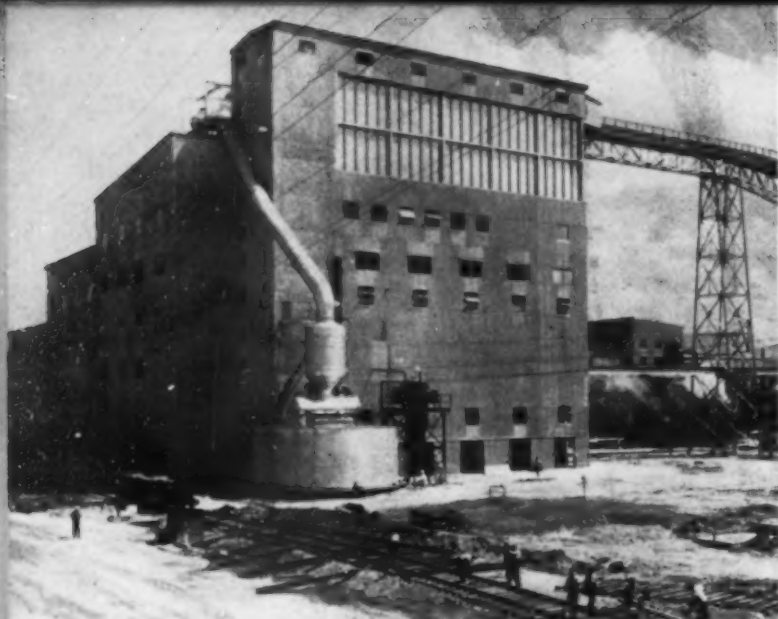
The causticizing unit is interesting as it is a semi-continuous system. The plant is composed of several



The causticizing unit is housed in three separate buildings grouped closely together. It is a semi-continuous system. The two lime kilns are in the foreground. The 565 ft. chip conveyor is on the right

The reservoir near the mill is part of the interesting water system that supplies from 25,000,000 to 35,000,000 gal. a day





Chips conveyed to the bins at the top of the digester building are cooked, washed, refined and converted into paper in the machine-room on the far end of this group



On the left is the power house and on the right the chemical recovery building

separate operations all of which are continuous except for the actual causticizing reactions. It is designed to produce the necessary strong white liquor for 265 tons of kraft pulp per day but is ample for 300 or more tons.

The whole unit is housed in three separate buildings all of which are grouped close together. Although the process is part batch and part continuous the operations between the three buildings are smoothly coordinated together. It is in the causticizing and slaking building that the actual batch system takes place. This plant is linked to the following buildings by a balance tank located in the liquor settling room for adjusting any surge in the flow of materials.

The causticizing building is at the discharge ends of the lime kilns. It houses the lime mixing tanks, the causticizing tanks and the Dorr bowl classifier. The reburtn lime falls directly from the kilns into mixing tanks. Centrifugal pumps circulate the milk of lime into the

classifier and thence into either of the causticizers. When starting a batch each tank is filled with clear green liquor. The milk of lime is then pumped from each mixing tank into the classifier above the causticizer. The bowl overflow enters the batch tank being causticized. This tank has a return line to the slaker tank so that the material is constantly circulated until the alkali has reached the desired strength. When this point is attained the circulation of the milk of lime is changed by a system of valves thus starting the next batch. While the second batch is causticized the first batch is pumped to the liquor settling room and, after pumping, it is again filled with green liquor ready for the following batch to be completed.

When the batch is completed it is removed from the causticizing department to a white liquor balance tank holding 70,000 gal. in the clarification building. The slurry is pumped to the Dorr white liquor clarifiers. The mud is delivered to a sludge tank and the white liquor overflows to one of three storage tanks on the outside.

The green liquor from the dissolving tanks at the recovery boiler is passed through a trommel screen and is stored on the outside of the building. It is clarified and delivered by gravity flow to a large storage tank near the causticizing building. The green liquor overflow is removed from the bottom of the tank and is fed to a washer.

The arrangement of the equipment in the clarification building is unique, for all the settling tanks are supported on steel framework well above the ground level. On the ground level are the white liquor feed tank and the lime mud tank.

Three filters are installed on the top floor of the third building of the group. The primary filter handles the lime sludge pumped from the lime mud tank in another building. The filter cake is washed and repulped. Water is added and the whole is divided between the two filters at the feed end of the kilns. The mud is again washed and dropped into the helical screw conveyor feeding the kilns.

Salt cake is purchased from European sources and delivered at the company's docks in the ocean-going vessels with a minimum of handling.

While the company owns large timber reserves, as previously noted, it is now contracting with local farmers for much of its wood supply. In order to assure a continued supply of wood it is only purchased from those farmers who agree to reforest the lands. It is delivered at the plant in trucks, railroad cars and barges. Due to the mild climatic conditions prevailing during the entire year in the Carolinas it is not necessary to store large amounts of wood in the mill yard.

The wood is debarked and chipped in the usual manner. The chips are conveyed on a 565 ft. rubber belt up a 16 deg. inclined steel frame work to the bins at the top of the digester building. The wood is cooked in five digesters.

Wash Pans Are Used

In this mill wash pans or tanks are used instead of the more customary diffusers. They are steel tanks, 22 ft. in diameter and 18 ft. in depth with a false bottom. Twelve of these tanks have been installed and three more will be added in order that each one of the five digesters will be served by three wash tanks. The pulp is led into the tanks by means of a large, jointed pipe, one end of which

swings over the series of tanks and discharges into any one of them. Each tank has the capacity of the digester. The three tanks in a series permit thorough washing of the pulp.

When the contents of the digester has been delivered to a wash tank the spent liquor is drained off through an outlet below the false bottom and is delivered to the strong liquor storage tank in the chemical recovery department. The pulp is then washed with weak liquor and later with hot water. The washed pulp is removed through an opening in the side of the tank, just above the false bottom.

When the washing is completed the pulp is passed through the knotters, refining screens and high density thickeners, and goes to the chests. From these it may go either to the wet or fourdrinier machines depending upon whether it is to be partially dried and shipped to the other mills of the company to be made into paper or to be made into paper at this mill.

The Last Word in Machines

The fourdrinier liner board machine installed at this mill has been designed to operate between 350 to 1,400 ft. per min. depending upon the thickness of the board product. It is interesting for many reasons, chief among which is the fact that it is one of the widest machines in operation. The initial production when manufacturing .016 liner is expected to average 400 tons per day with a possibility of considerably increasing this tonnage later by the installation of an additional section of drying cylinders, according to R. S. Johnson of Pusey & Jones Corp. who described the improvements incorporated in this great machine before the Springfield meeting of the American Pulp and Paper Mill Superintendents Association (*Paper Trade Jour.*, July 1, 1937).

For handling the tremendous volume of stock the flow box is made of ample proportions of two compartment design with additional intake compartment connected to the stock piping. Each main compartment is equipped with an adjustable baffle and each partition with removable top sections to compensate for change in stock head. A streamlined effect is obtained by providing a semi-circular bottom in each compartment with the flow space between partitions and baffles progressively larger in size for the purpose of slowing down the stock and insuring

uniform flow to the sluice. A large perforated motor driven roll is provided in the flow space just ahead of the apron, serving as a current breaker and stock distributor. Construction consists of light steel plate stainless clad on the inside, supported on a rigid structural steel framework with interior wood partitions and baffles.

Throughout the construction of the wet end section every precaution was taken to protect all exposed parts against corrosion, at the same time insuring the necessary strength and rigidity combined with lightness in weight of all running and shaking parts, and with this in mind all heavy parts such as the main frames, removal beams, etc., were heavily sprayed with a coating of lead and practically all of the light parts made of stainless steel or bronze. Even the holding bolts were made of stainless steel and fitted with special lock washers as insurance against possible damage to wires due to broken bolts or loose nuts.

Return wire rolls and press felt carrying rolls were made of light steel tubing with Monel metal by a special welding process resulting in a solid metal surface resistant to acid or alkaline white water, alum and corrosive stock, also particularly effective against the scoring action of doctors. The many features assist in making this machine the most modern and efficient large tonnage unit yet installed anywhere in the world.

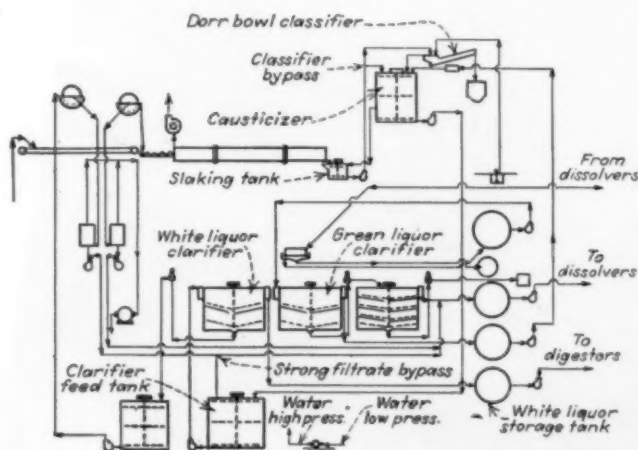
And finally on leaving the machine the paper passes through two stacks of calenders, a reel, winder and an auxiliary 4 drum winder for running off special shipping rolls.

Modern Wiring Pays Dividends

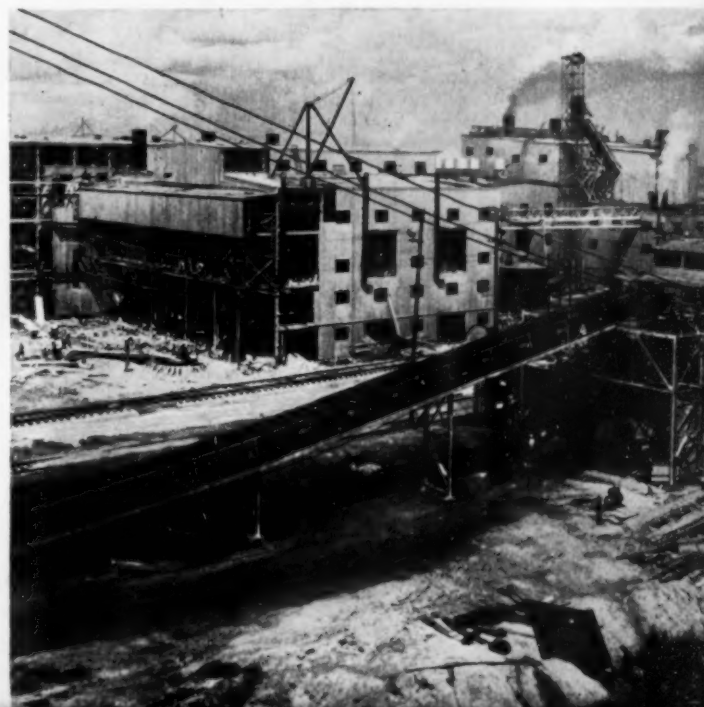
Before closing the comments on some of the outstanding features of this fine kraft pulp and paper mill, mention should be made of the unusually splendid facilities for supplying the power requirements of the plant. When the mill was designed the engineers made generous allowance for ample power at all load centers, jordans, fourdrinier and other machines.

Well laid out wiring has demonstrated its ability to avert breakdowns and avoid production losses from low voltage and poor power factor. Special types of cables have been installed in all locations where excessive moisture, high temperatures and chemicals would otherwise result in rapid deterioration.

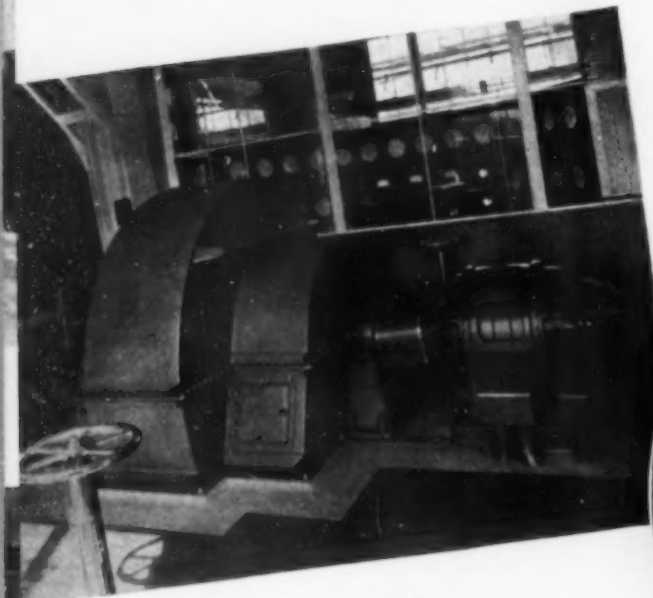
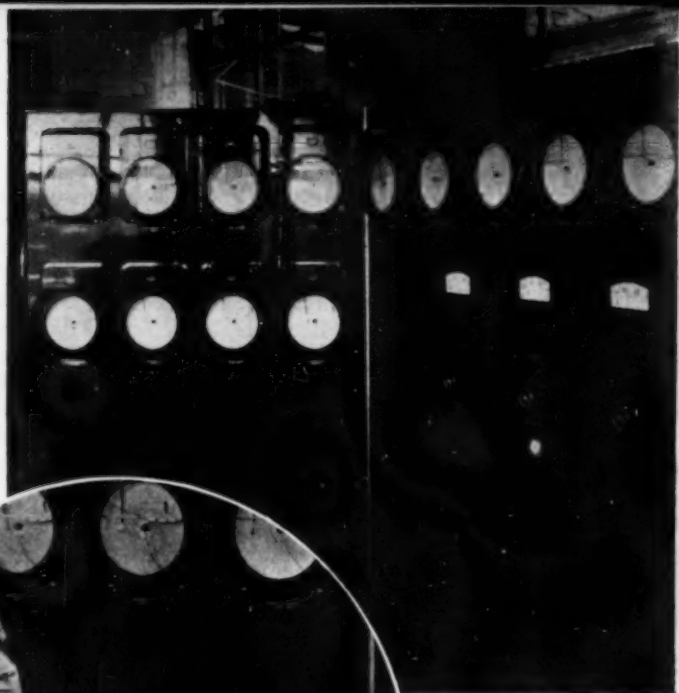
Although the causticizing system is part batch and part continuous, the operations are smoothly coordinated



In the right foreground are the debarkers. The chemical recovery buildings appear in the rear



The instrument panel and dispatcher's table comprise the nerve center of the system. The instruments record pressures and flow at various stations in the blast-furnace and coke-oven gas lines, volume of gas in the holders, and pressure, flow, and mixer speed at the butane mixing station. On the dispatcher's table are colored indicator lights, electric valve controls and telephone connections with various points throughout the plant



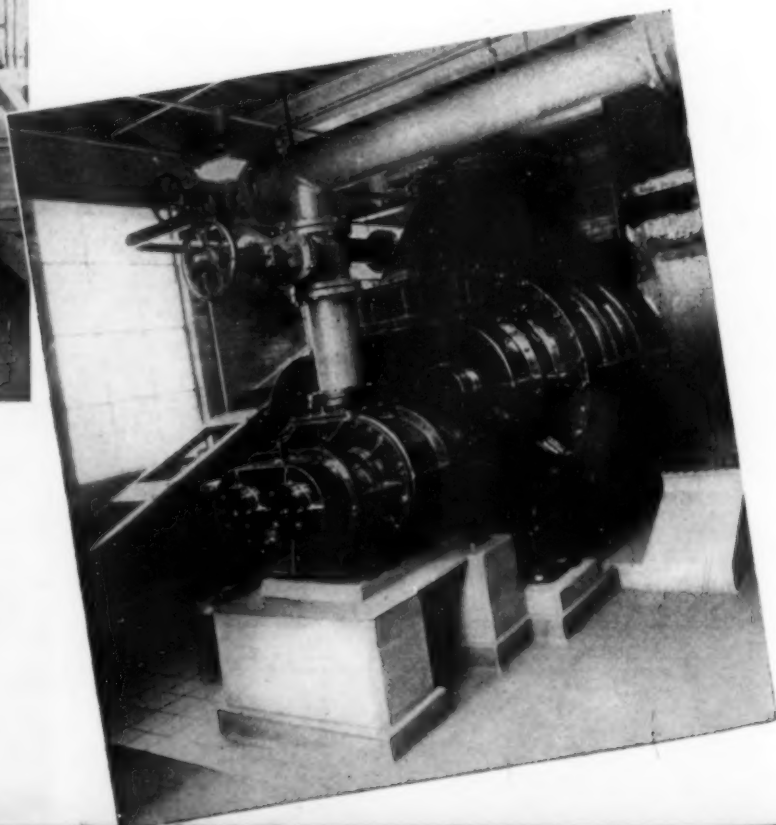
The dispatching office is located in the blast-furnace gas booster station. Pressures in both suction and discharge mains of the blast-furnace gas boosters (above) are recorded on the dispatcher's instrument panel

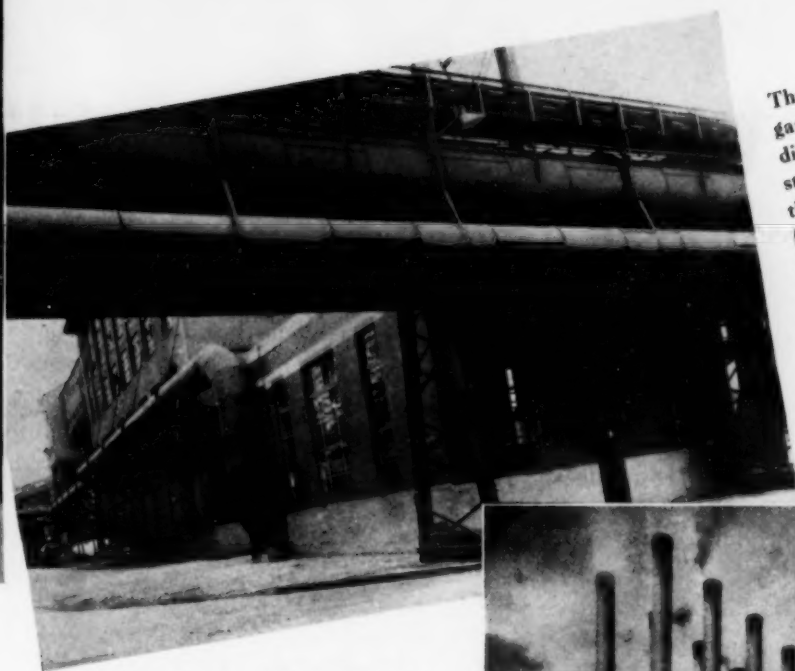
GAS DISPATCHING at the

Accurate and instantaneous control of gas handling on a large scale is the most novel feature of the new dispatching equipment at the Ford Motor Co.'s River Rouge plant. The economic significance of



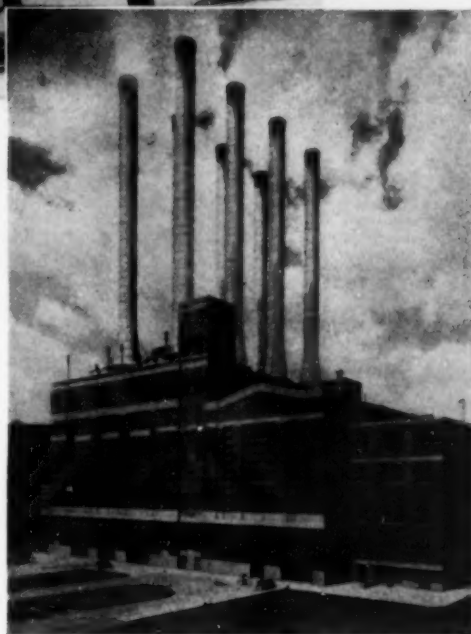
A vital factor in control and efficient utilization is accurate mixing to maintain uniform heating value of the gas. In the butane station this is accomplished by two direct-connected, positive-displacement blowers (right), the smaller one being driven by butane vapor under pressure and in turn driving the larger one which acts as a metering unit for the incoming blast-furnace gas. Exact B.t.u. maintenance is achieved by a Calori-Mixer (above) which controls the injection of additional butane into the mixed gas coming from the blowers





The magnitude of this gas-handling project is indicated by the huge 60-in. steel main used to convey the raw blast-furnace gas from the booster station to the butane mixing station, new coke ovens, and coke-oven gas dilution station

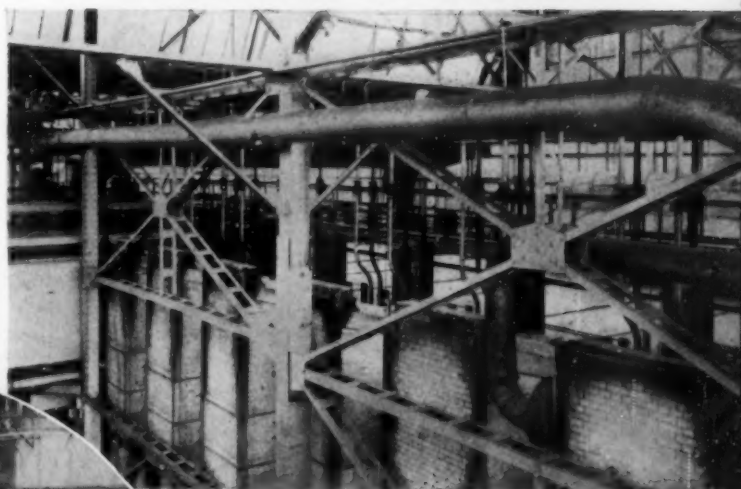
After all customer departments are supplied and holders are filled, any surplus gas goes to the power house. The boilers have three separate wall inlets for fuel so they may be fired at will with powdered coal, blast-furnace gas, or coke-oven or mixed gas



Ford Motor Plant

this equipment and its interrelation with the other gas facilities were explained in Chem. & Met. in May. The accompanying illustrations are offered as a pictorial supplement to this earlier material.

Coke-oven gas is sent out from this compressor station and the turbo-compressor station. Its pressures at different consumer points are recorded on the dispatching instrument panel



One of the major gas-using departments of the works is the glass plant. This unit is normally fired with intermediate-pressure coke-oven gas although it is provided with an emergency stand-by supply of propane-air gas

How Thermal Conductivity of Metals Affects Equipment Heat Transfer Rates

Probably even to a greater extent than is noted by the authors, there is a tendency for occasional, and even experienced, equipment designers to assume that the thermal conductivity of the metal can be neglected in estimating overall heat transfer rates. Permitting the effect of the metal actually to be visualized, this article should dispel this fallacious notion once and for all.

By F. L. LaQUE and C. ROLLE

DEVELOPMENT AND RESEARCH DIVISION
INTERNATIONAL NICKEL CO.
NEW YORK, N. Y.

DESIGNERS and operators of heat transfer equipment often have to estimate the probable effect of changing either the nature or the thickness of the metal or alloy used for heat transfer surfaces. There are, unfortunately, still a few who arrive at a result by such simple means as assuming either that the metal has no effect, or that it is responsible for the entire resistance to heat flow and that the apparatus will function in the ratio of the thermal conductivities of the metals. Of course, neither line of reasoning will lead to the correct answer. Proper calculations must include the effects of films on the heat transfer surfaces, as well as the properties and thickness of the metal itself.

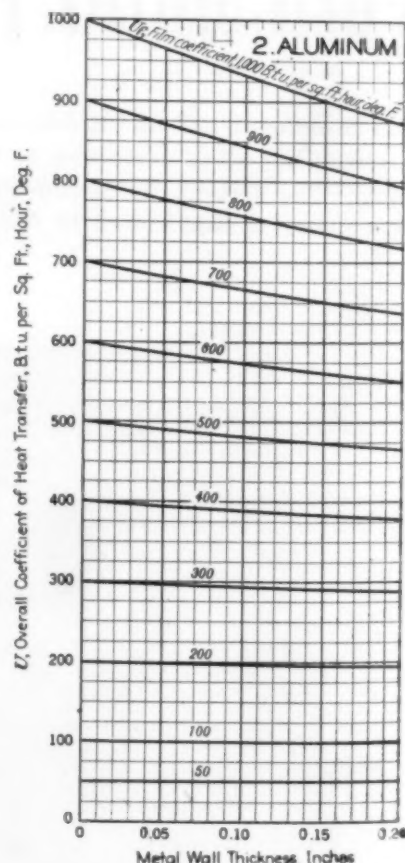
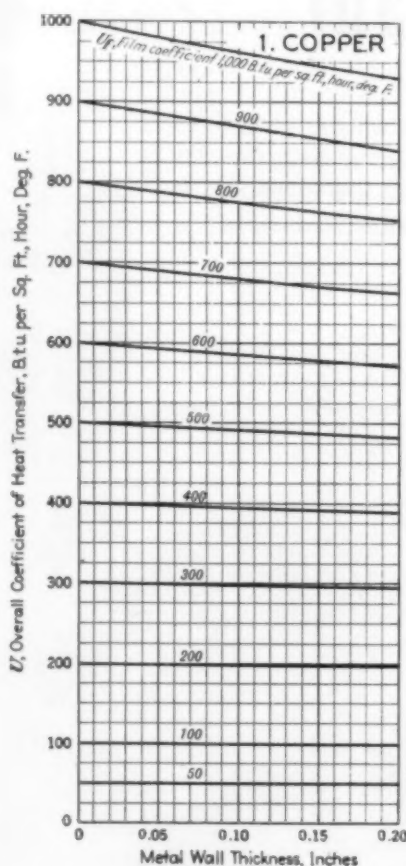
Arriving at a proper estimate requires certain arithmetical calculations, the results of which always must be modified on the basis of the calculator's experience so as to take into account several variables which are not capable of being reduced to precise mathematical terms. These other variables include the corrosion resisting characteristics of the metal, its proneness to form coatings of insoluble corrosion products, its tendency to promote dropwise or film type condensation of vapors, and the facility with which liquids can wet its surfaces.

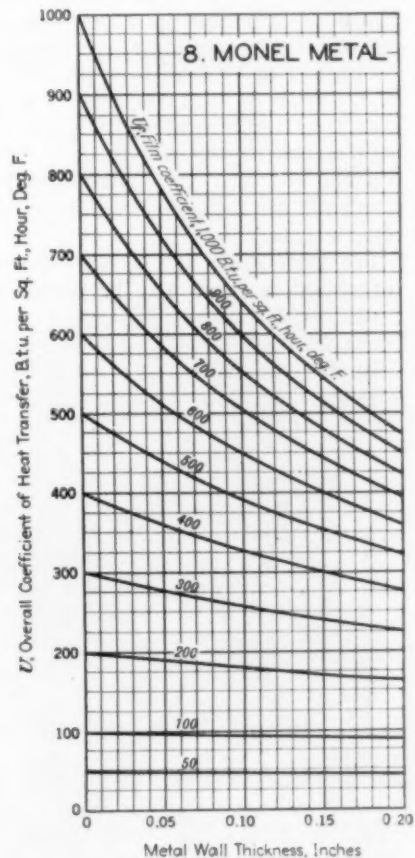
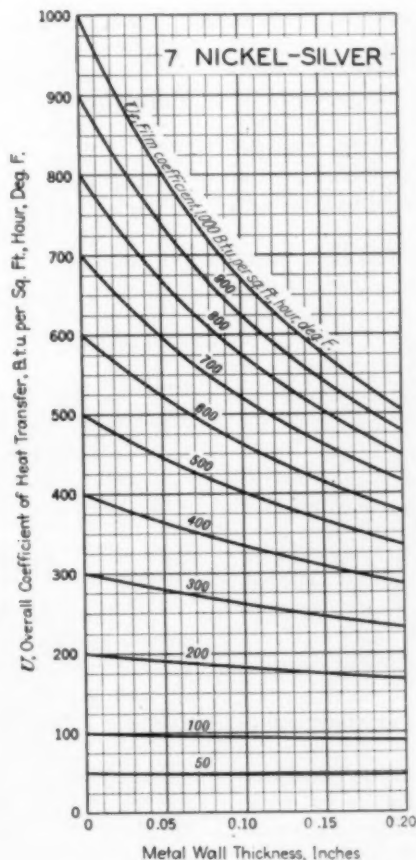
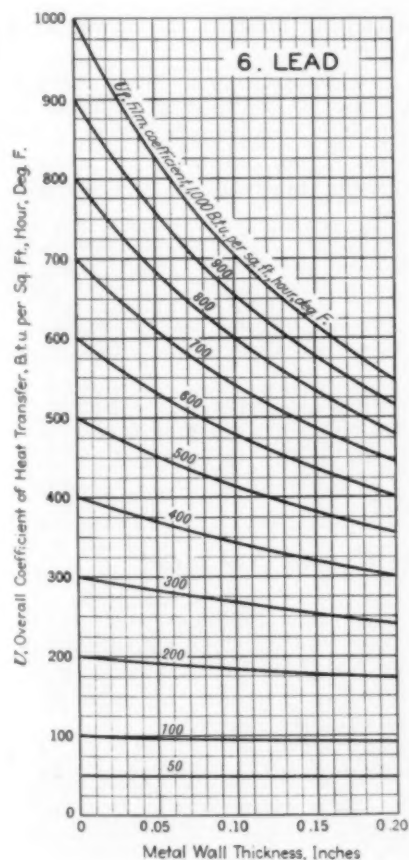
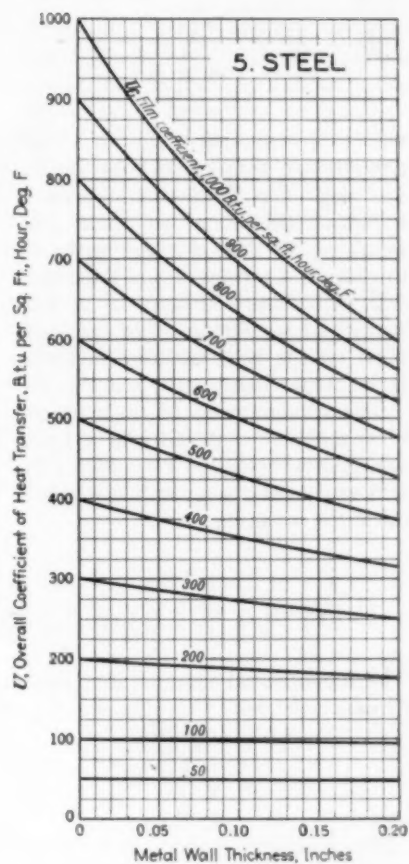
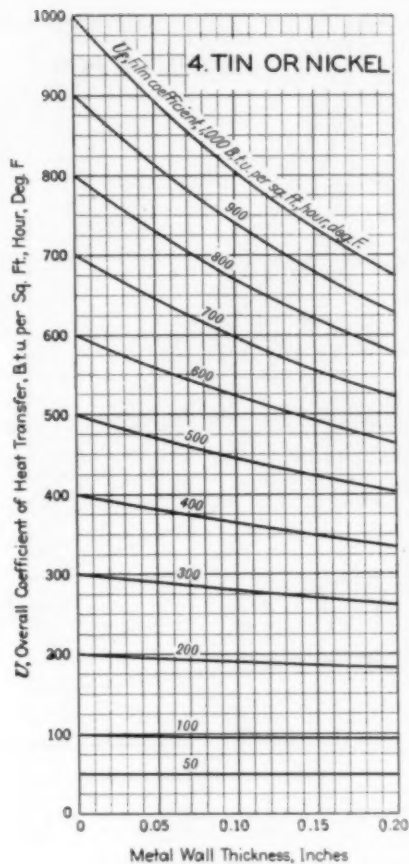
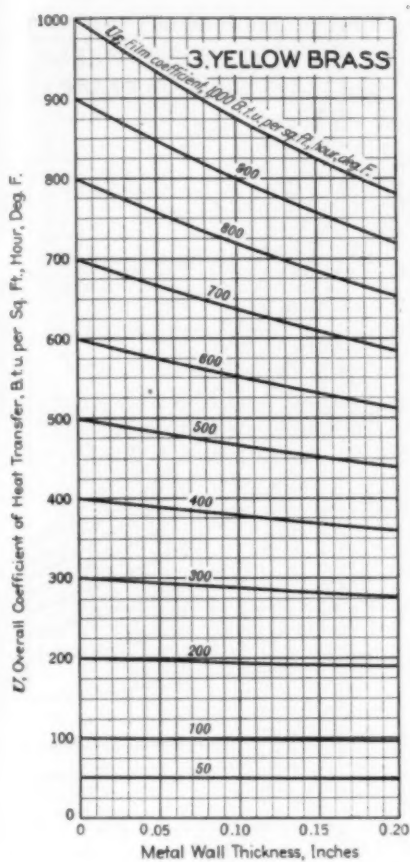
The arithmetic itself is fairly simple and the charts presented here represent the results of such arithmetic calculations referring to several common metals and alloys in the range of thickness most frequently used. These charts cover the range of overall rates of heat

transfer commonly obtained in practice where the metal or its thickness, within the limits covered, has any appreciable effect on the final results.

For preparing the charts, calculations were made based on the following fundamental equation for overall rate of heat transfer:

(Please turn to page 440)





$$U = \frac{1}{\frac{X}{K} + \frac{1}{f_1} + \frac{1}{f_2} + \dots + \frac{1}{f_n}}$$

where U =overall rate of heat transfer in B.t.u. per hour, sq.ft. and deg. F.; K =thermal conductivity of the metal in B.t.u. per hour, sq.ft., deg. F. and inch of thickness; X =thickness of the metal wall in inches; and f_1, f_2, \dots, f_n etc. =thermal conductance of various films on the heat transfer surfaces in B.t.u. per hour, sq.ft. and deg. F.

The conductances of the various films may be combined into a term which may be called U_f and which will represent the overall film conductance, so that:

$$\frac{1}{U_f} = \frac{1}{f_1} + \frac{1}{f_2} + \dots + \frac{1}{f_n}$$

The fundamental equation then may be expressed as:

$$U = \frac{1}{\frac{X}{K} + \frac{1}{U_f}}$$

It is evident from this equation why it is not proper either to neglect the effect of the metal itself, or to consider only the effect of the metal. Proper weight must be given both to the value of X/K and of $1/U_f$ in arriving at a correct result.

Charts 1 to 10 have been prepared by assuming values of U_f from 50 to 1,000, and metal wall thicknesses, X , from 0 to 0.20 in. and applying these to twelve commonly used metals having ten different values for the thermal conductivity, K . The values used for K , shown in the tabulation for the several metals, are believed to represent reliable data.

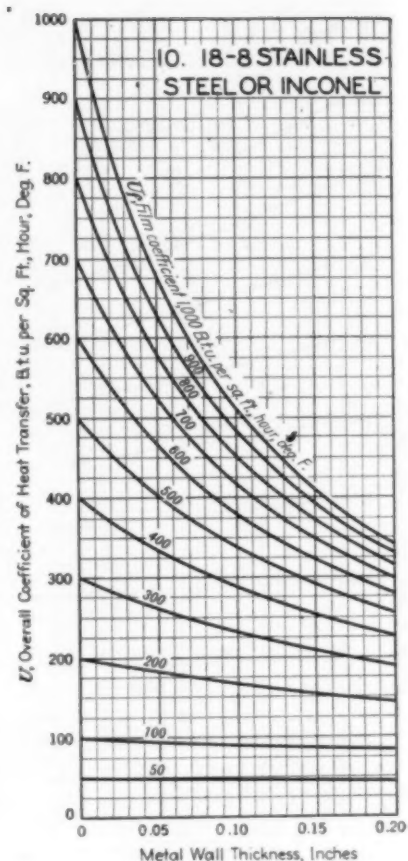
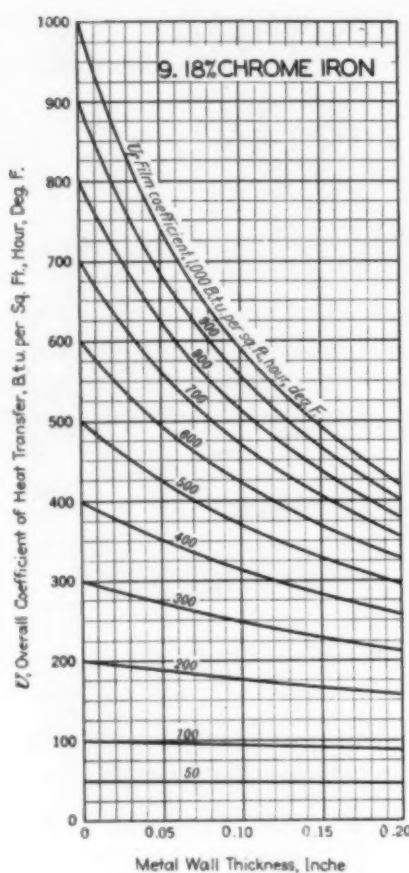
For each value of U_f , therefore, and for each metal considered, a curve may be plotted of U vs. X . Chart 1 shows such curves for copper, while the other charts cover the materials listed in the tabulation.

In the original design of equipment it is necessary to estimate the values for film coefficients on both sides of the heat transfer surface and to combine them to find U_f . The primary purpose of these curves, however, is to enable the operating man to compute the effect of changing metal thickness gages or the nature of the metal in a piece of equipment already in operation.

It is a simple matter to determine the existing value of U for the equipment if it is not already known. The use of these charts facilitates the estimation of what the new heat transfer rate will be.

Use of these charts will yield the following information:

1. The overall film coefficient of the existing equipment.
2. The overall rate of heat transfer in the event that either the nature of the metal is changed, or its thickness is increased or decreased, or both. This result cannot take into account supplementary changes in the heat



transfer characteristics of the equipment which may accompany a change of material.

By examining the general form of the curves as a whole, it will be seen that:

1. Materials of low thermal conductivity have a greater effect on the overall rate than do materials of high thermal conductivity. This is made evident by the steep slope of the curves for Inconel, 18-8 stainless steel, and such materials, as compared to the almost flat curves for copper.

2. As the film coefficient decreases, the choice of metal has less effect on the overall result. This is illustrated by the vast difference between the $U_f = 1,000$ curves for copper and Inconel, and the similarity between the $U_f = 50$ curves for these and all other materials.

3. As the film coefficient decreases, the thickness of the metal wall has less effect on the overall results. This is evidenced by the fact that for any material the $U_f = 1,000$ curve is steep as compared to the $U_f = 50$ curve for the same material.

How the Curves Are Used

To illustrate the use of these curves, consider a condenser having copper tubes 0.125 in. thick and showing an overall rate of heat transfer, U , of 750 B.t.u. per hour, sq. ft. and deg. F. It is desired to estimate the value of U if nickel tubes 0.078 in. thick are substituted.

From Chart 1, when $U = 750$ and $X = 0.125$ in., the intersection of these lines is found to be between the curves $U_f = 700$ and $U_f = 800$; interpolated U_f is found to be about 780. Turning to Chart 4 with $X = 0.078$ in., and projecting upward to a point between the $U_f = 700$ and

Thermal Conductivities of Some Common Metals and Alloys

Material	Thermal Conductivity, B.t.u. per Hour, Sq. Ft., Deg. F. and In. Thickness	Chart Number
Copper.....	2,640	1
Aluminum.....	1,380	2
Yellow Brass.....	720	3
Tin.....	420	4
Nickel.....	420	4
Steel.....	300	5
Lead.....	240	6
Nickel Silver (18% Ni).....	205	7
Monel Metal.....	180	8
18% Chrome Iron.....	145	9
Inconel.....	105	10
18-8 Stainless Steel.....	105	10

$U_f=800$ curves, interpolated to be $U_f=780$, the U scale shows a value of 680 for the new tubes.

It is evident that this result is based on the assumption that U_f will remain constant for the two tubes. This is not always the case because:

1. A material which has a lower rate of corrosion

will develop less fouling and will, therefore, be conducive to better heat transfer. Consequently, when changing to a more corrosion resistant material, rates of heat transfer will probably be higher than calculated. Newly installed materials will usually show higher rates of heat transfer than after they have been in service for some time, and the initial advantage of a less corrosion resistant material may not be maintained over a more highly corrosion resistant material having lower thermal conductivity.

2. Some materials are inherently better as to film coefficients, and even this tendency will vary with the film condition, i.e., liquid being heated or cooled, condensing vapor, evaporating liquid or dry gas being heated or cooled.

The experienced designer or operator of equipment will be able to adjust the arithmetically calculated results by taking such factors into account in arriving at a final estimate.

High Capacity Attained by New Sulphur Melter

By J. W. SCHWAB and W. W. DUECKER

TEXAS GULF SULPHUR CO., NEW YORK, N. Y.

ALTHOUGH sulphur is always sold in the solid form, in few chemical processes it is so applied. In the majority of industries it is melted before entering operations or before being changed into articles of commerce. This procedure is generally accepted as standard practice and is sometimes accorded little or no thought. Sulphur simply is removed from the stock pile, dumped into rectangular tanks fitted with steam coils and allowed to remain there until fluid or until ready for use.

Sulphur, however, is a poor conductor of heat and because of inadequate equipment the melting operation is sometimes slow and considered bothersome. Believing that the practice could be improved and costs reduced, the Texas Gulf Sulphur Co. has been experimenting for some time in the development of new equipment. As a result of this work there has been evolved an efficient and economical melter, which may prove to be of interest to many users of sulphur.

The new melter, designated the Tegul sulphur melter, is shown in Fig. 1. It consists of a rectangular tank or shell provided with steam coils at its sides and in its interior; it differs from the conventional type of equipment in that the lower part of the shell is provided with inclined, steam-jacketed, V-shaped troughs, the crests of which are about 10 in. apart. Slightly above these troughs and directly over their centers are placed additional steam coils, as shown in Fig. 2. To these inclined V-shaped troughs and to the steam coils directly over their centers may be attributed the novelty and efficiency of the new apparatus.

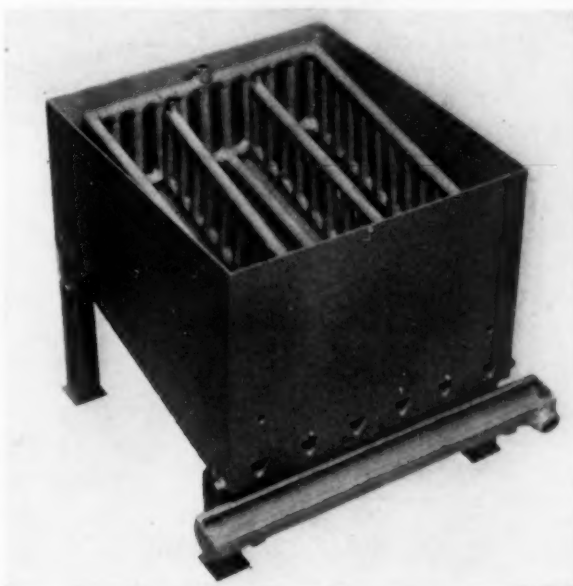
The operation of the melter is simple. Sulphur is charged into a hopper over the melter and its weight presses it against the steam coils and heated troughs. The steam coils directly over the troughs prevent bridging and insure a constant feed of sulphur to the heating surfaces. The melted sulphur flows in the inclined V-shaped troughs

and is discharged as fast as it is formed through a series of small openings in the side of the shell into a steam-jacketed trough on the outside of the tank. From this point it may be conducted to a sump or place of use.

Economic Considerations

Compared with ordinary melting equipment, the capacity of the new melter is remarkable. This may be judged from the data given in Table I in which the Tegul melter is compared with a small upright cylindrical melter, 18

Fig. 1—Tegul sulphur melter assembled



in. in diameter and 26 in. high, provided with a coil, 53 ft. long, of $\frac{1}{2}$ in. standard steel pipe and operated under the same steam pressure (100 lb. gage). The small melter was covered with $1\frac{1}{2}$ in. of magnesia sectional block covering. The Tegul melter was insulated with 3 in. of rock wool. According to these data 1 lb. of 100 lb. gage steam melted 10 lb. of sulphur in the Tegul melter, compared with 3.9 lb. of sulphur in the regular melter. This is in spite of the fact that the small melter was provided with 1 sq. ft. of heating surface for every 25.6 lb. of bulk sulphur, compared with 1 sq. ft. of heating surface per 37 lb. of sulphur in the new melter. On the same basis the new melter delivers 1,050 lb. of sulphur per day per square foot of heating surface, compared with 325 lb. for the ordinary melter.

The efficiency of the Tegul sulphur melter may also be compared with the operation of a large sulphur melting pit, 4 ft. wide, 4 ft. deep and 30 ft. long, containing 235 lineal ft. of standard wrought $1\frac{1}{2}$ in. iron pipe, data concerning which are listed in Table II. These data, although they are not directly comparable (because the large melting pit was operated under 60 lb. and the Tegul melter under 100 lb. gage steam pressure), indicate that in the new melter occupying but one-third the floor space, nearly four times as much sulphur can be melted in one hour. The new melter has a capacity of 3 long tons an hour compared with 1,750 lbs. for the large pit. This efficiency is due in large measure to the novel design of the new

melter which enables the molten sulphur to be removed as fast as it is formed and insures a continual renewal of the bulk sulphur in contact with the heating surfaces. Because the liquid sulphur is removed as fast as it is formed, it has little chance to overheat or become viscous, and hence the output of the melter may be increased even above this figure by using higher steam pressures.

The unit is exceedingly flexible. It may be brought to full capacity in 10 or 20 minutes, and it may be shut down even more rapidly. Its output may be varied by changing the steam pressure and once placed in operation it requires no attention. Because of its compactness and ease of operation, it may in some respects alter the conventional ideas regarding the handling of sulphur. Provided with a hopper, as shown in Fig. 3, and placed near the sulphur stock pile, either in the open or in the storehouse, new economies may be effected. Sulphur need simply be elevated to the hopper and conducted as a liquid either to a storage sump or point of use. Extraneous matter in the sulphur may be removed at the melter by passing it through a proper strainer or settling tank. The presence

Table I—Comparative Data Regarding Sulphur Melting Equipment

	Conventional Sulphur Melter	Tegul Sulphur Melter
Steam pressure, lb. gage.....	100	100
Approximate cubical capacity bulk sulphur, lb.	300	5,700
Sq. ft. heating surface.....	11.7	154
Pounds sulphur per pound steam at 100 lb. gage.....	3.9	10
Pounds sulphur per hour.....	157	6,720
Pounds sulphur per day per sq. ft. heating surface	325	1,050

Table II—Data Regarding a Sulphur Melting Pit

Steam pressure, lb. gage.....	60
Approximate cubical capacity bulk sulphur, lb.	39,000
Sq. ft. heating surface.....	117
Pounds sulphur per hour.....	1,750
Pounds sulphur per day per sq. ft. heating surface	360

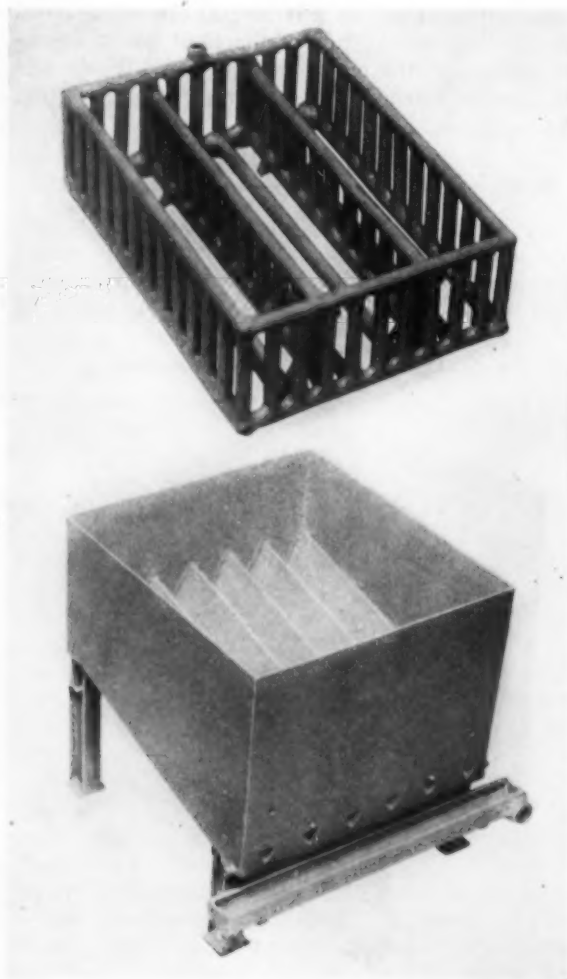
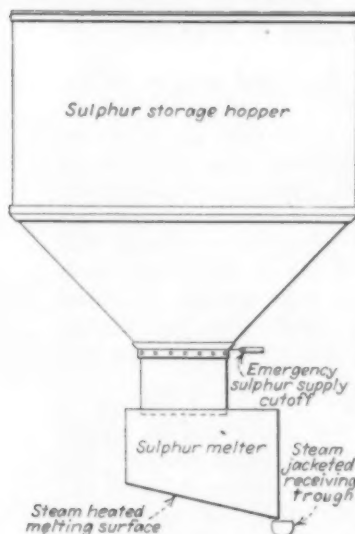


Fig. 2—Sulphur melter showing shell and heating coil separated

Fig. 3—Suggested arrangement of sulphur hopper and Tegul melter



of moisture in sulphur stored in the open often causes difficulties in that such sulphur foams when melted in the conventional equipment. In the Tegul sulphur melter such moisture is dissipated as steam rising through the sulphur in the hopper and the liquid sulphur discharged is perfectly dry.

Since the new sulphur melter has proved so efficient and simple, the Texas Gulf Sulphur Co. will be glad to pass on to all sulphur users further information regarding its design, construction, and operation, supplying interested companies working drawings so that the equipment may be constructed in their own shops.

Glycerine vs. Diethylene Glycol

To the Editor of Chem. & Met.:

Sir:—Your issue of March, 1936, carried an article by three members of Philip Morris & Co. entitled "Cigarette Industry Rules out Rule-of-Thumb." In the course of it the claim was made that "use of diethylene glycol in place of glycerine constitutes one of the major advances in recent years in the manufacture of cigarettes." The claim rested on two sets of tests, one made in the laboratory by Mulinos and Osborne, the other clinically by Frederick B. Flinn.

In justice to your readers, they should be informed that those tests have since been duplicated by other investigators who have published their reports, and that supplementary experiments have been made. These later findings throw serious doubts—to put it mildly—upon the validity of the "major advance" claimed by the Philip Morris representatives.

The refutation of the claims for diethylene glycol as against glycerine as the hygroscopic agent in cigarettes has been published in the following reports:

1. *Studies on the Physiologic Action of Diethylene Glycol, I. The Effects Upon the Irritating and Toxic Properties of Cigarette Smoke.* By H. B. Haag, M.D., *The Journal of Laboratory and Clinical Medicine*, January, 1937.

2. *Effects on the Throat and Conjunctiva of the Hygroscopic Agent Used in Cigarettes.* By Howard C. Ballenger, M.D., and V. H. Johnson, B.S., *Archives of Otolaryngology*, January, 1937.

3. *Alleged Influence of Glycerine and Diethylene Glycol Upon the Irritating Qualities of Cigarette Smoke.* By Harold G. O. Holck and A. J. Carlson, *Proceedings of the Society for Experimental Biology and Medicine*, 1937.

Space in a letter does not allow a discussion of the conclusions reached by Haag, Ballenger, Johnson, Holck and Carlson, all authorities in their fields. Suffice it to say that they refute, specifically and in detail, the statements on the subject made in the article in your columns under the signatures of the tobacco company's employees. The Haag article meets the Mulinos-Osborne assertions; the others sharply contradict Flinn.

The company, for obvious commercial

reasons, has continued its claims in a high-powered advertising campaign to the medical profession and the public, completely ignoring the published refutation of its contentions. Curiously enough, certain medical journals continue to publish full-page Philip Morris advertisements that make these same claims, despite the fact that the refutation is on record in the medical press itself.

But chemical engineers ought to know the facts behind the advertising. Those who read and may have accepted the Philip Morris contentions in your March, 1936 issue should, in the interest of professional objectivity, read the later developments as detailed in the reports I have listed.

MILTON A. LESSER
Chemist and Consultant
Brooklyn, N. Y.

TEACHING QUALIFICATIONS

To the Editor of Chem. & Met.:

Sir:—"If the young engineers of industry are attracted by the human values and the scientific and professional opportunities afforded by a career in teaching they need only make known their demands"—your editorial of June, 1937. Lately I have been in touch with four schools for teaching positions. It turns out that all of them have a major objection to academic inexperience in a proposed teacher. Contact starts on that keynote, runs through several letters, interviews, recommendations, and dismisses on the same note.

Something ought to be done. You pointed out that "to fill such a position (in teaching) calls for a fully qualified chemical engineer rather than a professional educator." You suggest that the requirement of teaching experience is unwarranted. All of today's instructors started somewhere with no teaching experience. Every new course in the most ivy-covered of academic walls involves inexperience. Every "standard" course in technical subjects must be constantly enlarged, modified, or re-oriented in the light of new developments in its subject matter and in the struggle with other courses for the student's time.

No doubt high school Latin or seminary theology can be organized into a semi-permanent syllabus, but for technical schools Mr. Hilton had the phrase if not the idea when he wrote "Good-bye, Mr. Chips."

It's an old industrial custom to get men from totally different industries from time to time. The new viewpoint and lack of preformed prejudices are advantageous to a progressing organization. Religious, military and business units shuffle their men around from time to time to develop their members for the greater advancement of the organization and its purposes. A political organization that fails to do likewise is usually a dictatorship where progress is distinctly not wanted. Might not educational organizations become a little more liberal? The schools admit the logic for their students, the record shows it for their administrative officers—so why not apply it to the proposed instructing staff?

Should not previous teaching experience—generally in the order of memory of faces, pleasant voice, lack of absent-mindedness, legible blackboard writing—be reduced to a minor attribute for your young men? Otherwise the whole point of your editorial is lost: no experience, no teaching, and no teaching, no experience. And it's too late for many of our young men to marry the professor's daughter.

M.I.T. CHEMICAL ENGINEER '23
Pulp and paper industry
Boston, Mass.

WE'RE STILL LOOKING

To the Editor of Chem. & Met.:

Sir:—On page 327 of the June 1937 issue of *Chem. & Met.* there appears a letter entitled "Is There a Tool?"

Please consider us a subscriber to the same inquiry. We distribute our products in 400-lb. drums. Almost all the customers want a good drum opener. If you find one please let us know about it.

HENRY L. FRAZIER
Sales Manager
The Opalco Laboratory
McKeesport, Pa.

Hydrocarbon Chemistry

THE REACTIONS OF PURE HYDROCARBONS. By *Gustav Egloff*. A.C.S. Monograph Series, No. 73, Reinhold Publishing Co., New York City. 842 pages. Price, \$16.75.

Reviewed by *Benjamin T. Brooks*

THE VOLUME of published chemical research has become so great that monographs of this kind are always welcome. Indeed it has become difficult for an author to review even the limited subject matter within the relatively narrow confines of a "monograph" without the assistance of others. In the present instance the author acknowledges the co-operation of the following colleagues: Malcolm F. Dull, Margaret Kurbatov, Badona L. Levinson, C. D. Lowry, Jr., C. I. Parrish, R. E. Schaad, C. L. Thomas, H. S. Bloch, Prudence van Arsdell, George Hulla and Edith Wilson.

The title "Reactions of Pure Hydrocarbons" is perhaps misleading in that Dr. Egloff and his able collaborators have primarily limited themselves to the pyrolytic decompositions and polymerizations of hydrocarbons. Those who look to this monograph for chemical reactions of hydrocarbons in the broader sense, such as oxidation and chlorination, will perhaps be misled. However, within the field covered, the present work is unusually thorough and the results are presented fairly with no indication of bias for the author's own views.

Most of the hydrocarbons whose behavior is described were pure (as hydrocarbons go). In the main the host of impure hydrocarbons is kept in the background, although sometimes they are brought well to the fore. In the introduction it is stated that "The petroleum industry is guardian over fabulous volumes of gases, oils, asphalts. The coal industry in its turn has within its scope an estimated quantity of some 7,000 billion metric tons of coal and lignite, starting material containing valuable hydrocarbons of which all manner of use may be made. Moreover, hydrocarbon oil to the estimated amount of 300 billion barrels is potentially present in oil-shale deposits . . . Added to them are the many places in nature, from the sea to the stars, where more or less sizable amounts of hydrocarbons appear in conjunction with other substances."

Speaking of oil gas the author states "The amount of olefins that can be made from this source is limited only by the production of crude oil, and is therefore enormous."

Many petroleum chemists and also those familiar with terpenes will scarcely agree with the statement that "terpenes have also been isolated from crude mineral oils of Galicia, Roumania; Grozny and Baku of Russia; Canada; Beaumont, Texas; and Java." A reference is made to Engler and Höfer, in the case of the Java oil, although these authors never identified any terpene from crude petroleum but spoke rather loosely of "terpene hydrocarbons." Some of the Gulf Coast petroleum yield fractions having a marked terpene-like odor but do not resemble terpenes in any other respect.

The theories of hydrocarbon decomposition and polymerization are thoroughly and impartially discussed. The quantity of data compiled and presented is enormous. The author had indeed a difficult job in appraising and correlating, if possible, all the work of the earlier hot-tube chemists with the excellent recent contributions of Hurd, Pease, Spence, Frolich, Tropsch, Ipatieff and others. The value of the book is greatly enhanced by an excellent index.

METALLURGY OF LEAD AND ZINC. Vol. 121, A.I.M.E. Transactions. Published by the American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City. 748 pages. Price, \$5.

THE AIM of this volume, as stated by its editor, is to summarize as completely as possible the current practice in production and refining of lead and zinc. This has been effectively carried out by presenting the material in the form of thirty specially solicited papers by various Institute members who are at present actively engaged in the lead and zinc industries.

The book is not of the textbook variety but rather is in the nature of a symposium. The papers include historical surveys of lead and zinc production in America, current blast-furnace practice in several lead-producing districts, studies of lead blast-furnace drosses, continuous and electrolytic lead refining, fume and dust collection, zinc

smelting and refining processes, and electrolytic zinc production.

One phase of the subject not touched upon in the book is that of treatment of secondary materials. Although it is mentioned that much experimentation is being carried out along this line, it seems that few plants as yet care to have their methods discussed.

DIE VERFAHREN DER ANORGANISCH-CHEMISCHEN INDUSTRIE. Edited by Dr. W. Siegel. Published by Urban & Schwarzenberg, Berlin, Germany. 591 pages.

THIS SECOND annual edition of a world-wide compilation of inorganic chemical patent abstracts covers those patents issued in 1935. The abstracts are given in brief but sufficient detail, are frequently illustrated where clarity requires it, and for convenience are arranged alphabetically according to subject. Exceptionally good indexing under countries and their patent numbers, patentees, and chemicals and other materials, greatly facilitates use. It is interesting to note that the number of U.S. patents abstracted is practically twice that of any other country.

CHEMICAL NITROGEN. U.S. Tariff Commission Report No. 114, second series. Available at Government Printing Office, Washington, D. C. 300 pages. Price, 25 cents.

MADE UNDER the general investigatory powers of the Tariff Commission as provided in the Tariff Act of 1930, this report presents an extensive survey of the chemical nitrogen industry. It covers production processes, organization of the industry, trade in the principal products into which nitrogen enters, domestic and international economic factors, competitive conditions and imports and exports. Not to be confused with nitrogen of organic origin, "chemical" nitrogen is considered as only that obtained from the air, or from coal or other mineral sources, by manufacturing processes.

SOCIAL SECURITY IN AMERICA. Social Security Board Publication No. 20. Available at Government Printing Office, Washington, D. C. 592 pages. Price, 75 cents.

THIS WORK is "the factual background of the Social Security Act as summarized from staff reports to the Committee on Economic Security." Part I includes a summary of foreign experience with various types of employment insurance, and data regarding the United States, including estimates of unemployment, an actuarial study of costs, and a discussion of various phases of standards for classification, compensation, and administrative procedure. Part II relates to old-age security problems, Part III to child problems, Part IV to provisions for the blind, and Part

V to Public Health Service projects. Although essentially a defense of the policy as fixed under the Social Security Act, there are included large masses of pertinent information which make the volume a valuable reference.

BIBLIOGRAPHY OF PULP AND PAPER MAKING, 1936. Compiled by Clarence J. West. Published by the Technical Association of the Pulp and Paper Industry, New York City. 285 pages. Price, \$3.

THE pulp and paper making literature published during 1936 is listed here along with some titles from 1935 which were not available when the 1928-1935 *Bibliography* went to press. Also listed are the patents issued during 1935 and 1936 which are of interest to the pulp and paper industry. Dr. West and his compilers have covered 149 domestic and foreign periodicals and have minutely classified their findings by subjects.

WHO'S WHO IN ENGINEERING, 1937. Edited by Winfield Scott Downs. Published by the Lewis Historical Publishing Co., Inc., New York City. 1638 pages. Price, \$10.

THE NEW EDITION of this book contains the professional records of 12,000 American engineers, an increase of 14 per cent over the number represented in the 1931 edition. Also listed are the various national, state and local engineering societies along with the names and addresses of their secretaries, size of membership, and nature of their principal activities. The book is a valuable and convenient biographical reference.

SELECTED BIBLIOGRAPHY OF ENGINEERING SUBJECTS. Section I—Mathematics, Mechanics and Physics; Section II—Aeronautical and Civil Engineering; Section III—Chemical and Industrial Engineering; Section IV—Electrical and Mechanical Engineering; Section V—Metallurgical and Mining Engineering. Published by the Engineers' Council for Professional Development, 29 West 39th St., New York City. 58 pages total. Price, 10 cents each section.

FOR THOSE who wish to continue study in engineering and allied fields and perhaps start building their own libraries, this book list offers a select group of references in each of the various fields of engineering. The books are mostly of college grade and are listed with a short description to indicate the nature and depth of subject matter.

It is obvious upon glancing through the list that it is not intended to be exhaustive, but rather aims to bring together the best and most up-to-date books available. The final selections are claimed to represent a consensus of recommendations obtained from over 100

professional engineers and teachers of technical subjects.

SECHAGE DES PRODUITS HYGROSCOPIQUES. By *Edouard Ledoux*. Published by Librairie Polytechnique Ch. Beranger, Paris, France. 93 pages. Price, 25 fr.

CHEMICAL ENGINEERS will find this little volume an excellent aid in problems dealing with the drying of porous solids. A clear quantitative analysis is given of the adsorption phenomena involved and methods for calculation. Numerous charts, graphs, humidity tables and details of apparatus enhance its comprehensive value. The book will also be of interest to workers in the air conditioning fields.

ACHEMA JAHRBUCH, 1937. Founded by Max Buchner. Published by Verlag Chemie, G.m.b.H., Berlin W. 35. 391 pages.

REPORTS recent developments and

progress in German chemical engineering apparatus. Particular references to the various pieces of equipment exhibited at Achema VIII, German chemical equipment exposition held at Frankfurt-on-Main, July 2-11, make this a valuable record for those who attended or were interested in the exposition.

REDUCTION OF HOURS OF WORK IN THE CHEMICAL INDUSTRY. International Labor Office, Geneva, Switzerland. 174 pages. Price, \$1.

AT THE 1937 International Labor Conference at Geneva (see report by U. S. delegate Theodore J. Kreps on p. 418 this issue *Chem. & Met.*) this booklet was used as the basis for discussion on hours of work in the chemical industry. It gives an account of existing regulations in this field and an examination of the problems arising in connection with the drafting of international regulations.

RECENT BOOKS AND PAMPHLETS

A. S. T. M. Standards on Petroleum Products and Lubricants. Available from American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. 372 pages. Price, \$2. Gives in latest approved form 56 methods of test, five specifications and two lists of definitions of terms relating to petroleum and road materials.

U. O. P. Laboratory Test Methods for Petroleum and Its Products. Universal Oil Products Co., Chicago, Ill. 250 pages. Price \$3. Ninety-one complete test procedures of various physical and analytical natures for such petroleum products as asphalt, road oil, coal, shale, lignite, coke, crude oil, fuel oil, gas, gasoline, inhibitors, diesel fuels, lubricating oils and solvents. Scope, procedure, precautions, accuracy, sample calculations, and a number of further references are given for each test.

American Standards. Available from American Standards Association, 29 West 39th St., New York City. 12 pages. An indexed list of titles and prices of American engineering and industrial standards and safety codes issued up to March 15, 1937.

Annual Survey of American Rubber Chemistry, 1936, by Webster N. Jones. Carnegie Institute of Technology, Pittsburgh, Pa. 40 pages. A classified descriptive bibliography of rubber chemistry literature published during 1936.

The Australian Council for Scientific and Industrial Research—Ten Years of Progress. Published by the Council, Melbourne, Australia. 67 pages. A review of C. S. I. R.'s research work relative to plants, animals, soils, foods, mining and radio.

The Biologic Digestion of Garbage with Sewage Sludge, by Babbitt, Leland and Whitely. Engineering Experiment Station Bulletin No. 287, University of Illinois, Urbana, Ill. 112 pages. Price, \$1. Presents findings of an investigation of the nature and intensity of the additional load placed upon sewage treatment plants and water courses by the water carriage method of garbage disposal. The studies are restricted principally to the digestion of garbage with fresh sewage sludge, and to methods for the dosing of digestion tanks.

Bitumen and Petroleum in Antiquity, by R. J. Forbes. Published by E. J. Brill, Leiden, Netherlands. 109 pages. Impressive evidence of the durability of bitumens in building, water-proofing and road-making is offered by this extensive survey of their use and sources as far back as several thousand years B.C.

Correlation Between Metallography and Mechanical Testing, by Herbert F. Moore.

Engineering Experiment Station Reprint No. 9, University of Illinois, Urbana, Ill. 35 pages. Price, 20 cents. Henry Marion Howe Memorial Lecture presented at New York meeting of A.I.M.E., February, 1936.

Lead Frits and Fritted Glazes, by J. H. Koenig. Engineering Experiment Station Bulletin No. 95, Ohio State University, Columbus, Ohio. 116 pages. Price, 50 cents. Contains information relative to the use of lead compounds in dinnerware glazes.

Science Reports of the Tohoku Imperial University, Sendai, Japan, Vol. XXV, No. 5. Available from Maruzen Co., Ltd., Tokyo and Sendai, Japan. 363 pages. This volume of the reports contains seventeen papers on chemistry, physics and mathematics. Eleven are printed in English, four in German, and two in French.

Vanadium Steel and Irons. Published by the Vanadium Corporation of America, New York City. 189 pages. Contains information on the properties and working, heat-treating, and hardening of alloy steels and irons containing vanadium. Numerous graphs show the effects of heat treatment on the physical properties of vanadium steels of various compositions. Attractively bound in leatherette cover.

Chemische Analysen mit dem Polarographen, by Dr. Hans Hohn. Verlag von Julius Springer, Berlin. 102 pages. Price, 7.50 RM.

Cours de Chimie Industrielle, Vol. IV, by G. Dupont. Published by Gauthier-Villars, Paris, France. 250 pages. Price, 60 fr. This is the fourth of five volumes which will comprise a course in industrial and applied chemistry. This volume deals with the organic industries and is divided into four very inclusive chapters headed as follows: Oils and Fats; Glucoside Industries; Industrial Derivatives of Wood and Cellulose; Explosives and War Gases.

Elektrowärme: Droste Verlag und Druckerei K.G., Dusseldorf, Germany. Einzelpreis, RM 1.50. A new German technical magazine covering all phases of the field of electrical heating. Published monthly.

La Corrosione dei Metalli—Cause, Effetti, Protezione, by G. Guidi and G. Guzzoni. Published by Ulrico Hoepli, Milan, Italy. 373 pages. Price, 50 lire.

Rutilo no Brasil, by S. Froes Abreu. Instituto Nacional de Tecnologia, Ministerio do Trabalho Industria e Commercio, Rio de Janeiro, Brazil. 32 pages. Discusses the composition and uses of rutile, a mineral containing mostly titanium dioxide, and its occurrence in Brazil.

Machinery, Materials and Products

Bin Level Indicator

LEVEL OF PULVERIZED solid materials in bins and hoppers can be indicated or controlled by means of a simple electrical device, produced under the name of Bin-Dicator by the Bin-Dicator Co., 14615 East Jefferson Ave., Detroit, Mich. This device consists of a dust-tight canvas diaphragm which actuates a counterweighted lever, which in turn operates a mercury switch. When material in the hopper exerts pressure at the point where the diaphragm is mounted, the mercury switch is operated, giving the desired indication. A common method of use is to use two Bin-Dicators, one at the desired high level and one at the desired low level in the hopper. The switches may then be connected to signaling lights or they may serve to start or stop a motor driving a feeder or discharge device.

Numerous uses have been developed for this level indicator, on bins and hoppers, on elevator boots and conveyors, and for weighing and blending devices. The device is said to make possible reliable automatic control of machinery and to improve sacking weights.

Wet Dust Collector

DYNAMIC DUST PRECIPITATION has been employed successfully for a number of years, utilizing the Type D Roto-Clone, manufactured by the American Air Filter Co., Louisville, Ky. For more difficult dust precipitation prob-

lems, this company has now developed the Type W Roto-Clone, a modification of the basic type, in which the wetting effect of water is added to the dynamic separating principle. The new equipment combines exhaustor and dust collector in a single compact unit, requiring no greater space than a standard exhaustor of the same capacity.

By introducing a water spray at the inlet of the new collector, higher collection efficiencies are obtained with fine dust that can be wetted. For some cases, particularly with heavy dust concentration, the Type W apparatus is mounted on a combined settling chamber and pre-cleaner, in which the dust-laden air is first introduced and wet by a water spray. The air then enters the inlet of the Roto-Clone proper, where it is again sprayed with water. Owing to the peculiar shape of the fan blades, the wetted dust particles are precipitated on the blade surfaces and advanced to an annular sludge chamber, while the air discharges into a scroll as in an ordinary centrifugal fan.

The collected dust discharges in the form of a light sludge into the settling tank and is readily removed without creating a secondary dust problem. The

water consumption ordinarily amounts to not more than 20 gal. per hour per 1,000 c.f.m. of air exhausted. Roto-Clones of this type are manufactured in nine sizes, from 700 to 30,000 c.f.m.

Clean Gas Generator

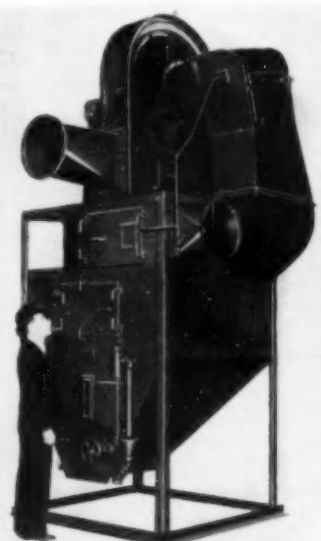
ACCORDING TO A recent announcement of the Wellman Engineering Co., Cleveland, Ohio, this concern now has exclusive rights to manufacture and sell within the United States the Galusha gas generator which is said to produce a clean, high-grade industrial gas from small anthracite coal or coke breeze. With this equipment production cost is said to be considerably below figures heretofore regarded as minimum.

Since the types of fuel used with the Wellman-Galusha generator do not yield tar, and since the method of operation is such that no dust is produced, the gas is said to be particularly adapted to industrial heating operations where cleanliness is requisite. Where hot gas can be used, overall efficiencies as high as 93 per cent are said to be attained while, if it is necessary to cool and wash the gas, the cold, clean product contains approximately 88 per cent of the heat in the solid fuel gasified.

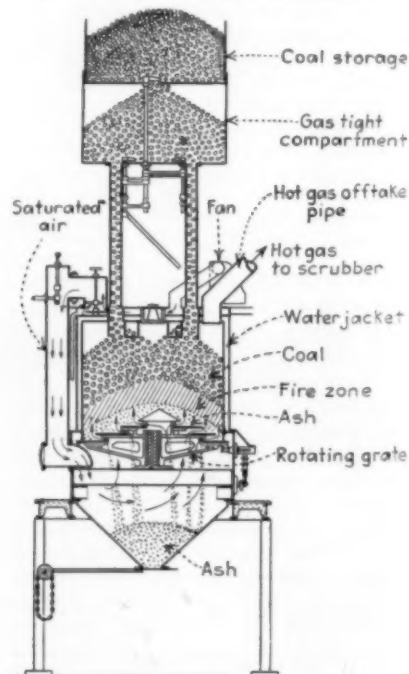
The principle of the new equipment will be evident from the accompanying drawing. An automatic two-compartment, fuel-feeding system is employed. The upper section acts as a storage bin while the lower, separated from it by a gas-tight gate, serves as the feeder proper. From the lower bin coal flows continuously through feed pipes to fill the fire chamber as fast as the revolving grates discharge the ash.

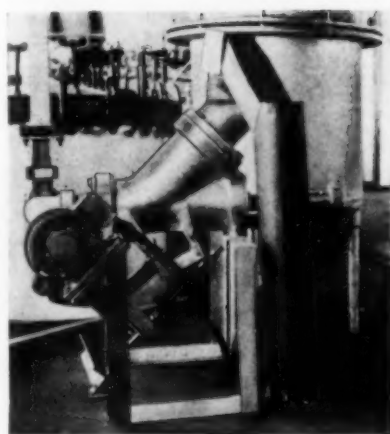
The gas-making chamber, which is of

Type W Roto-Clone equipped with pre-cleaner and settling chamber

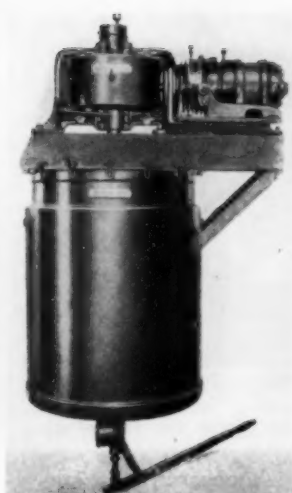


Cross section of clean gas generator

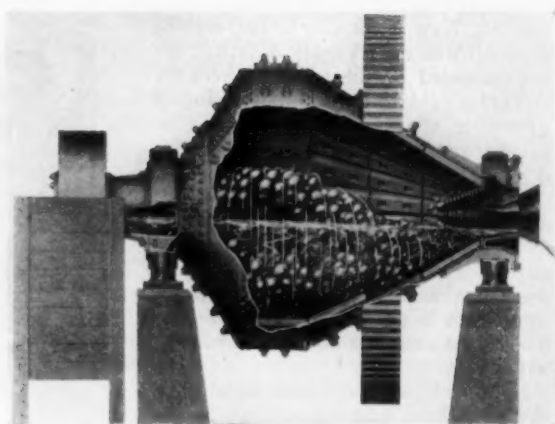




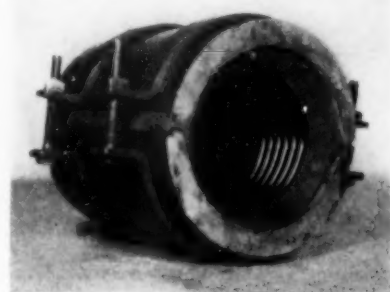
Motorized strainer operating on pulp



Double-motion-agitator kettle



Mill showing discharge grate improvements



Small split sleeve Flexlock joint

welded steel and requires no brick lining, is completely water-cooled. Water which is evaporated is picked up by the stream of air supplied under fan pressure to the space beneath the grate. Thus, the unit is self-contained and no separate source of steam is required. This feature of waste heat recovery is said to save a dollar or more per ton of fuel gasified. Saturated air passes up through the grate and into the burning coal bed, where a producer gas reaction takes place, producing a gas of about 151 B.t.u. heat content when anthracite is used, or 137 B.t.u. when coke is used. The gas filters through the fresh coal bed, preheating the coal and leaving the generator in remarkably clean condition, according to the manufacturers.

The revolving grate is also of novel design, consisting of three circular, heavy steel disks, flat and without perforations. They are set one above the other with edges overlapping and mounted eccentrically, so that as the entire assembly rotates, the eccentric action crushes the ash and discharges it into the hopper-shaped ash pit. The new generator is made in standard units with hearth diameters ranging from 18 in. to 10 ft. The largest unit will deliver various amounts of gas as desired, up to the equivalent of over 30,000 cu.ft. of city gas per hour. When coke is used, up to 50 per cent greater capacity is secured, depending upon the coke quality.

Continuous Strainer

THROUGH THE USE of an attached motor and suitable reduction and bevel gearing the Sarco Co., 183 Madison Ave., New York City, has developed a new type of automatic continuous flow strainer based on the hand-operated type previously made by the company. The strainer is placed in the line the contents of which is to be strained. Flow passes through a cylindrical screen and deposited solids are continuously removed by a spiral scraper from the screen surface and moved toward a sludge outlet from which they can be removed periodically or continuously, as desired. In the latter case it is usually necessary to bleed off a small flow of the material being strained, which after separation from the solids can be returned with the unstrained feed.

The accompanying view shows one of these strainers in operation, working on a fruit pulp. The strainer is installed upside down from the usual method so that the pulp can be discharged directly into an open hopper, thus avoiding waste of juice. Strainers are regularly made in sizes from 1 to 3 in., in any material necessary for the particular service.

Split Sleeve Joint

SUPPLEMENTING the standard line of Flexlock rubber joints for use in chemical stoneware lines, the U. S. Stoneware Co., Akron, Ohio, has announced the development of a complete line of Flexlock split sleeve joints which may be used to insert a new fitting or a new length of pipe in an old line. Their use is also suggested for lines which must be completely or partly taken down at intervals. They may be described as performing the same functions as unions in a screwed joint line. According to the makers, the new joint is by no means to be considered a tempo-

rary repair. Properly installed they are claimed to make as permanent a joint as the standard bell-and-spigot Flexlock. They have, in fact, the further advantage over the standard type in permitting twice the joint angularity.

Standard Agitated Kettle

FOR THE PROCESSING of all kinds of vegetable, animal and mineral oil products and for other process work, the Patterson Foundry & Machine Co., East Liverpool, Ohio, has placed on the market a line of motor- and belt-driven grease and soap kettles made in steel, stainless steel, aluminum, Monel metal and other corrosion-resisting materials. The kettles are supplied with double motion drives and stirrers revolving in opposite directions. They are powered with this company's horizontal Unipower drive, fitted with flush-type outlet valves, and made in sizes ranging from 50 to 2,000 gal. gross capacity.

Improved Mill Discharge

STATING it to be one of the most important recent improvements contributing to efficient wet grinding mill operation, the Hardinge Co., York, Pa., has announced the new reverse cone grate and high pulp level discharge, a development in wet mill construction which simplifies the design and is claimed to increase overall mill efficiency. In the new construction the grate is reversed and the pulp level discharge spout made much smaller so as to raise the pulp level considerably. One of the effects of the new construction is to keep the grate absolutely free and to reduce wear, according to the manufacturer, while at the same time it increases mill capacity.

New Products

TWO NEW PRODUCTS for the preservation of water solutions and emulsions containing vegetable and animal proteins, gums, etc., have been announced by the Glyco Products Co., 148 Lafayette

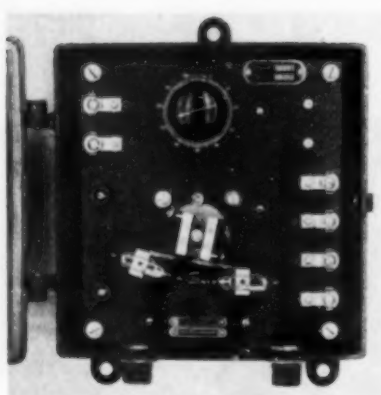
ette St., New York City. These products, Moldex and Aseptex (Tech.), are recommended by the manufacturers for retarding mildew, fermentation and mold growth in vegetable gums, casein, glue, gelatin and similar materials used for non-edible purposes. Being dry powders, they can be incorporated in the dry products themselves or water, glycerine or alcohol solutions can be made if desired. The manufacturers state that these products are finding considerable application in the textile, paper, leather, polish, cosmetic and similar fields.

PIONEER RUBBER Co., 1936 Tiffin Ave., Willard, Ohio, has recently discovered that by coating cotton fabrics with Thiokol synthetic rubber coating material, the fabric can be made resistant against oils, grease, gasoline and acids. Fabrics so coated are now being made up into work gloves under the trademark of W&G gloves, and into work clothing such as overalls and dungarees, all of which are recommended by the makers to workers in chemicals and petroleum products.

NO SPECIAL soldering equipment or special solder is needed for the soldering of stainless steel, it is claimed, when this operation is carried out using a new stainless steel soldering flux made by the Ruby Chemical Co., 68 McDowell St., Columbus, Ohio. It is stated that the flux does not give off strong, offensive odors in use, nor will it severely burn in contact with the hands. It is available in pints, quarts and gallons.

A HIGH DEGREE of resistance to extreme weather conditions, temperatures to 500 deg. F. and to the corrosion of acid and salt solutions and fumes, is claimed for paint produced with Lead-leaf metallic paste, a product of the Metalead Products Corp., Balfour Bldg., San Francisco, Calif. This material is a fine-leafed lead powder in paste form which is supplied to paint manufacturers for distribution together with a suitable vehicle. It is available from such manufacturers in double compartment containers, with pigment and liquid in proper proportions for mixing. As a paint the material is recommended for priming bare metal or as a sealing coat on concrete and wood. Where the lead-grey color is suitable, it can also serve as a final coat. The material dries quickly, flows freely and is said to be extremely economical in application.

HIGH IMPACT resistance is claimed for a new line of molding materials introduced by the Bakelite Corp., 247 Park Ave., New York City. Molding materials in several gradations of impact resistance are available, each in two or more forms which emphasize such properties as superior chemical or water resistance or dielectric strength.



Anticipating device for controllers

Controller Accessory

TO ENABLE pyrometer controllers to anticipate temperature changes and correct the fuel consumption long enough in advance to prevent the temperature from hunting, the Bristol Co., Waterbury, Conn., has perfected an accessory device known as the B-Linator. This device can be used with practically all common types of pyrometer controller and can be added to present installations as well as incorporated in the control circuit of new equipment. Through a switching device it adds or subtracts an emf. to the regular thermocouple circuit to cause the controller to act in anticipation of a temperature change. The auxiliary voltage is derived from thermocouples in the B-Linator case, connected in series but opposing each other. The magnitude of the voltage produced by the thermocouples is dependent on the temperature trend.

Dustless Weigh Hopper

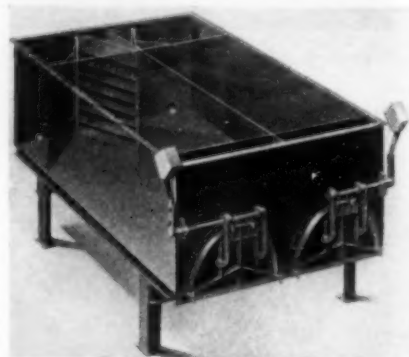
A NEW dustless weighing hopper for all kinds of powders, furnished with or without the weighing device, has been developed by the Read Machinery Co., York, Pa. It comprises a set of butterfly discharge gates for controlling the discharge of the hopper, operating coincidental with a sliding sleeve. The latter consists of two annular rings through the inside one of which the contents is discharged. The space between the rings permits the displaced air from the vessel beneath the hopper to return, carrying its dust, through the two flues within the hopper. In practice it has been found, according to the maker, that all dust is automatically returned to the hopper, without escape to the operating area.

De-Watering Tank

FOR USE WITH its Multi-Wash dust collection system (described in the August, 1931, issue of *Chem. & Met.*) the Claude B. Schneible Co., 3951 Lawrence Ave., Chicago, Ill., has developed a new rectangular type multi-louver de-



Cutaway view of dustless weigh hopper



Phantom view of sludge dewatering tank

watering tank of simple construction. This equipment is presented for use with smaller dust collection systems, where the quantity of water and sludge produced does not justify the use of larger capacity dewatering equipment. As shown in the accompanying illustration, the tank is made with a divider down the center, separating it into twin tanks for alternate use. At one end is the sludge and water inlet distribution trough just inside and above the sludge discharge gates. At the opposite end are located the weir, skimmer walls, the multi-louvers and the recirculating and dewatering outlets.

Sludge and water from the collector is piped to the de-watering tank, entering one of the sections. Precipitation of the solids is said immediately to take place, the skimmer wall holding back floating material as the clear water overflows the weir, from which it is pumped back for re-use. When one tank is sufficiently filled with precipitated material, the water is switched to the other section of the tank.

Roller Coater

ACCURATE CONTROL of coating weight and adaptability to a wide range of different coating materials are important features claimed for the Meadows Roller Coater, recently announced by Colloid Equipment Co., 50 Church St., New York City. The machine is of sturdy construction, having a wide range of adjustments to match specific require-

ments. Using a separate furnisher roll is said to insure the application of a smooth, continuous coat without wasteful non-coated margins. A circulating pump and automatic level control of the coating material in the furnish pan can be supplied when desired, and the machine can be equipped with or without a knife coating attachment. Machines are available in width from 40 to 70 in. and for speeds from 25 to 75 yards per minute.

Industrial Heater

AN ELECTRIC heating unit consisting of a Calrod heating element, around which is poured a cast aluminum grid to eliminate hot wires and dead air spaces, is an important feature of the new Electromode industrial heater (Model IBN) recently announced by the Electric Air Heater Co., Division of American Foundry Equipment Co., 555 South Byrkit St., Mishawaka, Ind. A motor-driven, four-bladed aluminum fan running on graphite-impregnated bronze bushings dissipates heat from the entire surface of the grid, and circulates the warm air. A thermal safety switch is provided to prevent damage to the grid from overheating should the fan or air circulation stop for any reason. Thermostatic control for holding temperature within two degrees is available if desired.

Equipment Briefs

GREAT ECONOMY of power, maintenance, investment, installation and space are claimed for the new Class WN-112 industrial air and gas compressors recently announced by the Sullivan Machinery Co., Michigan City, Ind. The new compressor type, available in displacements of 378, 480, 642 and 800 c.f.m., is a continuous, heavy duty machine, generally equipped with a built-in motor. Using radial cylinders, it re-

quires only a 6 x 8-ft. floor space for any of the above capacities. In addition to compressors, vacuum pumps, boosters for steam or gas and low or high pressure machines are also available in this construction.

PROTECTED against abrasive dust, moisture and corrosion, a new design of dual-ventilated, fan-cooled, squirrel-cage motor has been announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These motors, designated as Type CS, are said to be suited to severe service in cement plants, chemical works, tanneries, etc., and may be installed outdoors without additional protection. The motor frame contains two separate sets of air ducts, one set internal and one set external, separated by a common wall. An internal fan on the rotor circulates warm internal air through the internal ducts, the walls of which are cooled with large volumes of cool air by the external duct fan.

LUDLOW-SAYLOR Wire Co., St. Louis, Mo., announces further improvement in its Sta-Tru long mesh woven wire screen, which was first described on p. 161 of the March, 1937, issue of *Chem. & Met.* As first announced, this type of screen was provided with uncrimped transverse wires of rectangular section, spaced at intervals to take the tension in supporting the screen surface. The improved tension wires are oval in section, thus, it is said, relieving the crossing wires to an even greater extent of crimping strains and adding materially to the strength.

IN LINE with the present trend toward "packaged power plants," Steam Motors, Inc., Hunt St. at Galen, Newton, Mass., has announced the development of a compact, self-contained, steam generating unit capable of operating without the usual manual control. Models at present available have evaporation rates of 500, 800 and 1,200 lb. of water per hour at pressures from 50 to 1,000 lb. per sq.in. and total steam tem-

peratures up to 850 deg. F. All steam generators make use of this company's patented fuel oil burners, with automatic regulation and electric ignition. Boilers are of the water-tube type, designed for vigorous natural circulation. An economizer is furnished when necessary. The generator is fully insulated and provided with an automatically operated feed water system and automatic pressure regulation.

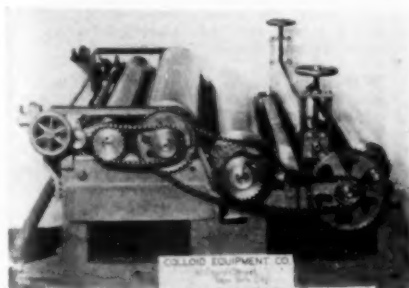
TWO NEW MODELS of Chronolog, instruments for measuring and controlling down time of machinery, have been announced by the National Acme Co., East 131 St. and Coit Rd., Cleveland, Ohio. These instruments provide a mechanically printed record of productive and down time, also showing the cause and extent of idle time and a count of units produced. They may be arranged to provide other production information if desired. Because they present an impersonal record, they are said to prevent labor disputes. In addition, they often increase production materially without requiring changes in the equipment. Model M records clock-time, number of units produced, and symbols indicating the reasons for interruption. Model O can be used either to count idle time or units produced.

AUTOMATIC self-cleaning by a method said to be thoroughly reliable and good for many years of use is available in the new Turbo-matic humidifier recently announced by the Parks-Cramer Co., Fitchburg, Mass. The new humidifier, which utilizes compressed air to atomize and evaporate water supplied to it by gravity, is an improvement of the Turbo humidifier made for many years by this company. The self-cleaning feature has been designed to operate every time the unit is started or stopped. An oil-proof composition diaphragm is employed to actuate a cleaning mechanism which automatically wipes the air and water orifices clean. The new units are of fixed capacity but available in various sizes. It is stated that evaporation is complete and no dripping is possible.

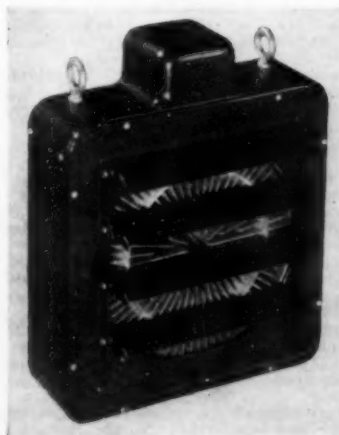
DESIGNED TO VENT dryers, steam coils, traps and other equipment automatically, under steam pressures up to 150 lb., the new high pressure air eliminator announced by the Gorton Heating Corp., Cranford, N. J., is said to simplify and improve operation of such equipment. Through its use, it is claimed that a more uniform temperature can be obtained in the heating coils than with hand venting, considerably reducing venting time. The operating member of the new unit is made of a special corrosion resisting metal, said to be very sensitive to heat changes and positive in operation. This member closes at 212 deg. F., remaining closed until the temperature again drops below that point.

Process Equipment NEWS

High speed roller coater



Aluminum-grid electric unit heater



MANUFACTURERS' LATEST PUBLICATIONS

Alloys. Colmonoy Inc., Los Nietos, Calif.—Bulletin 60—15 page revision of earlier bulletins of this company, describing overlay metals and corrosion resisting alloys; also accessories.

Alloys. International Nickel Co., 67 Wall Street, New York City—Nickel Cast Iron Data, Section 1, No. 6 and Section 3, No. 7—Respectively 20 and 15 pages, on alloyed cast irons in petroleum refining equipment; and heat treatment fundamentals of alloy and plain cast irons.

Alloys. Trenite Corp., Trenton, N. J.—4 page folder describing this company's alloy castings for resisting heat, corrosion and wear.

Chemicals. Carbide & Carbon Chemicals Corp., 30 East 42d St., New York City—78-page booklet covering specifications, properties and uses of over 80 aliphatic organic chemicals offered by this company.

Chemicals. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.—24-page booklet on Neoprene (chloroprene synthetic rubber) discussing properties and uses with particular reference to resistance to chemicals, petroleum products, heat and sunlight.

Chemicals. Krebs Pigment & Color Corp., Wilmington, Del.—Booklet summarizing properties and uses of this company's titanium pigments.

Chemicals. Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.—Bulletin 1—24 pages with particularly complete data section covering physical and chemical properties of caustic soda. Also describes in detail methods of handling and unloading.

Coatings. Goodyear Tire & Rubber Co., Akron, Ohio—8-page leaflet describing and giving color chips for a series of Pliolite concrete enamels said to be of exceptional durability.

Electrical Equipment. Louis Allis Co., Milwaukee, Wis.—60-page catalog describing construction features, advantages and applications of numerous commercial types of electric motor.

Electrical Equipment. Trumbull Electric Mfg. Co., Plainville, Conn.—Catalog 101—81-page catalog and price list covering safety switches, breakers, starting equipment and electric protective equipment.

Equipment. Patterson Foundry & Machine Co., East Liverpool, Ohio—Catalog 371—96 pages covering a wide range of equipment for use in clay and mineral working plants.

Finishes. Roxalin Flexible Lacquer Co., Elizabeth, N. J.—Leaflets describing a variety of types of cellulose-type flexible lacquer enamels made by this company, some with samples coated on metal.

Fire Protection. Walter Kidde & Co., Bloomfield, N. J.—Pamphlet AD481—4 pages describing hand and wheeled carbon dioxide fire extinguishers.

Fittings. Bonney Forge & Tool works, Allentown, Pa.—Bulletin WT23—16 pages illustrating and describing this company's stock weld fittings for use in the production of welded piping assemblies.

Furnaces. Hevi Duty Electric Co., Milwaukee, Wis.—Bulletins HD-537 and MU-637—Leaflets describing two heavy duty electric laboratory furnaces for respectively 2,000 and 1,750 deg. F. maximum continuous operating temperature.

Hoists. Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.—Bulletin 126—14 pages of engineering data on a

variety of stationary and traveling electric hoists.

Hose. Electric Hose & Rubber Co., Wilmington, Del.—64-page catalog, covering this company's complete line of braided and molded hose, indexed according to purpose.

Instruments. American Schaeffer & Budenberg Instrument Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.—24-page catalog describing the Controlograph, an instrument made in indicating and recording models for controlling temperature or pressure.

Instruments. The Bristol Co., Waterbury, Conn.—Bulletin 490—Discusses typical examples of telemetering and remote control by means of this company's Metameter; also new 12-page bulletin describing the Pyromaster round chart potentiometer pyrometer.

Instruments. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.—Bulletin N-96S-744A—20 pages on the use of automatic pH recording and controlling equipment in improving corrective water treatment; also Broadside N-33, 24-page folder briefly illustrating and describing all variations of four distinct pyrometer types of instruments made by this company.

Instruments. C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y.—Catalog 1060C—56 pages covering in detail this company's instruments for indicating, recording and controlling temperature and pressure, showing practical installation photographs.

Level Control. Cochran Corp., 3113 North 17th St., Philadelphia, Pa.—Bulletin 2675—16 pages illustrating and describing this company's liquid level control equipment for service in power and process fields.

Lighting. General Electric Vapor Lamp Co., Hoboken, N. J.—Bulletin 520—8-page brief discussion of engineering data and design relating to newly improved horizontal mercury vapor lights produced by this company.

Metals. Ludlum Steel Co., Watervliet, N. Y.—Pocket-sized book entitled "Fine Steels by Ludlum," giving charts, conversion tables, useful facts and other data on tool steels, stainless steels, Nitralloy and other special products.

Pigments. Ault & Wiborg Corp., 75 Varick St., New York City—Detailed laboratory report on characteristics and applications of Syan Blue B, a product produced from what is said to be the first new blue pigment developed in more than a century.

Plastics. Bakelite Corp., 247 Park Ave., New York City—16 pages briefly describing numerous uses of Bakelite materials.

Power Transmission. Continental Diamond Fibre Co., Newark, Del.—8-page catalog with engineering information on Celeron silent gears produced by this company.

Power Transmission. Morse Chain Co., Ithaca, N. Y.—Bulletin 49—18-page engineering data book on silent chain drives covering many phases of design and application of such drives.

Power Transmission. Sprout, Waldron & Co., Muncy, Pa.—Catalog H-531, Part 2—80 pages, with engineering data, covering a wide range of bearing supports, couplings, clutches, collars, take-ups, sprockets and other power transmission equipment.

Pulverizers. Raymond Bros. Impact Pulverizer Co., 1315 North Branch St., Chicago, Ill.—Bulletin 31—8 pages de-

scribing construction and applications of this company's impact pulverizers.

Pumps. Aurora Pump Co., Aurora, Ill.—Catalogs covering respectively this company's deepwell turbine pumps, single-stage centrifugal pumps, and two-stage centrifugal pumps.

Pumps. Ingersoll-Rand Co., Phillipsburg, N. J.—Bulletin 1972-B—8 pages on Cameron motor pump condensate return units.

Pumps. Worthington Pump & Machinery Corp., Harrison, N. J.—Publications as follows: Bulletin L-711-B2, 8 pages on single- and two-stage, horizontal, dry-vacuum pumps; Bulletin W-475-B8, 12 pages on double helical rotary pumps; also S-550-B13, 8 pages illustrating and briefly describing the use of sewage sludge gas for gas engine fuel.

Pumps. Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill.—Bulletin 3000—20 pages, with engineering data, covering this company's automatic electric heavy-duty sump pumps.

Refractories. Norton Co., Worcester, Mass.—Handling Heat No. 6—4-page leaflet describing uses of Alundum and Crystolon in kilns and kiln furniture.

Refractories. Refractory & Insulation Corp., 381 Fourth Ave., New York City—Bulletin R-31—4 pages on No. 3,000 refractory cement, a plastic air-setting adhesive cement, fusing above 3,000 deg. F.

Refrigeration. Ingersoll-Rand Co., Phillipsburg, N. J.—Bulletin 9143—Discusses applications and advantages of steam jet water vapor refrigerating units, giving rating curves and details of construction and operation.

Screens. John A. Roebling's Sons Co., Trenton, N. J.—30 loose-leaf catalog pages revising sections of this company's Woven Wire Fabrics Division catalog, covering tables and list prices on brass, bronze, copper, Monel, nickel and stainless steel wire cloths.

Separators. Stearns Magnetic Mfg. Co., Milwaukee, Wis.—Bulletin describing construction and operating characteristics of Type AM magnetic separators using A.C. current in treatment of fine, dry material.

Sifters. The Wolf Co., Chambersburg, Pa.—4-page leaflet briefly describing this company's new streamline sifter, providing a circular housing for standard flat interchangeable sieves.

Unions. E. M. Dart Mfg. Co., Providence, R. I.—12-page catalog and price list describing the range of unions and union fittings made by this company.

Valves. Crosby Steam Gate & Valve Co., 30 Church St., New York City—Catalog 101—79 pages covering a variety of safety and relief valves, with engineering data.

Valves. Merco-Nordstrom Valve Co., 400 Lexington Ave., Pittsburgh, Pa.—Bulletin V-119—13-page bulletin printed in four colors, describing the use of this company's lubricated plug valves in the chemical industry.

Welding. Lincoln Electric Co., Cleveland, Ohio—Engineering drafting room wall chart on weld design, revised to employ latest symbols adopted by American Welding Society.

Welding. Linde Air Products Co., 205 East 42d St., New York City—200-page handbook of information on layout and design of piping for welded connections, containing over 100 figures and tables with design data on welding of specific metals and other information.

Water Treatment. Darco Corp., 60 East 42d St., New York City—18-page booklet and special rule, the "Darco-graph," offering a simple means for determining activated carbon dosage in the treatment of water supplies.

ALIGNMENT CHART FOR CONVERTING WEIGHT FRACTION TO MOL FRACTION

By G. L. BRIDGER
Chemical Engineering Dept.
Iowa State College, Ames, Iowa

CONCENTRATION is frequently expressed by the mol fraction method in chemical engineering problems, such as those of distillation, absorption, etc. The relation between mol fraction and weight fraction for a binary system of A and B is given by the equation shown on the accompanying chart, where x_A is the mol fraction of A (mol per cent of $A/100$); w_A is the weight fraction of A ; and M_A and M_B are the molecular weights of components A and B respectively.

It is often necessary to convert a set of data from weight fractions or weight per cents to mol fractions or mol per cents, which is both laborious and time-consuming. An example of this is the preparation of the familiar x vs. y distillation diagrams for systems for which Trouton's rule does not hold. In this case it is necessary to assume a fictitious molecular weight for one of the components and calculate the mol fractions on this basis. Since this is often the case, the data in handbooks which are usually calculated on the basis of the true molecular weights can not be used as such, but must be recalculated.

The present chart has been designed to facilitate such calculations as those mentioned above. A few such charts have appeared in the literature but these have been of either limited range or limited precision.* The chart given here has been designed to cover the range in weight fraction of 0.01 to 0.99 (1 to 99 per cent) and the range of 1 to 10 in ratio of molecular weights, these ranges being inclusive of practically all cases met in chemical engineer-

ing calculations. In order to have the precision as uniform as possible over the whole range, a different scale factor was used for the low (0.01 to 0.10) and high (0.80 to 0.99) ranges of w_A than that used for the intermediate (0.20 to 0.80) range, and auxiliary scales were plotted for these ranges. This permits good precision in the intermediate range and allows the reading of at least three significant figures (in the larger original drawing.—Editor).

The chart is read by drawing a straight line between the desired values of M_B/M_A and w_A on their respective scales (taking care to read the w_A and x_A scales on the same side of the axes) and reading the value of x_A on its corresponding scale. If M_B/M_A is less than 1, then the ratio must be inverted, the corresponding values of x_B read, and this subtracted from 1 to give the desired value of x_A .

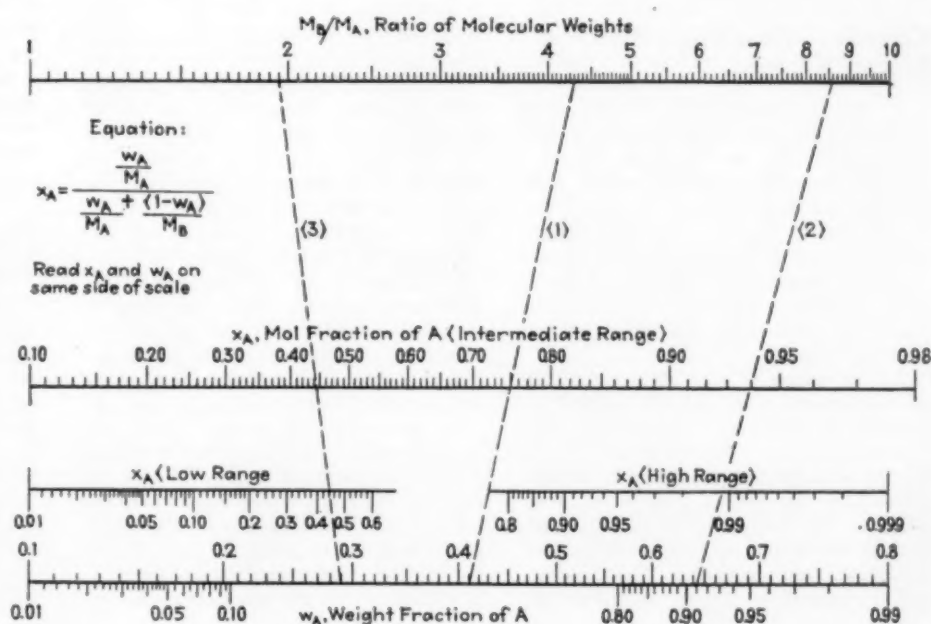
Use of the chart is illustrated by the following examples.

1, *Intermediate Range*—When $M_B/M_A = 4.30$ and $w_A = 0.410$, line (1) is drawn and x_A is found to be 0.750. Both w_A and x_A are read on the upper side of their respective scales.

2, *High (or Low) Range*—When $M_B/M_A = 8.60$ and $w_A = 0.910$, line (2) is drawn and x_A is found to be 0.988. Both w_A and x_A are read on the lower side of their respective scales.

3, *Molecular Weight Ratio Less Than Unity*—Suppose it is desired to find x_A when $M_B/M_A = 0.513$ and $w_A = 0.710$. Then $M_A/M_B = 1/0.513 = 1.950$ and $w_B = 1.000 - 0.710 = 0.290$. Draw line (3) using these latter values and find $x_B = 0.443$ (reading on the x_A scale, however). Then $x_A = 1.000 - 0.443 = 0.557$.

* For example, A. J. V. Underwood (*Trans. Inst. Chem. Engrs.*, 10, 1932, p. 145) developed an alignment chart which has extremely high precision at high concentrations, but permits only two-figure accuracy in the intermediate and low ranges of concentration. Other conversion charts are those of H. G. Nevitt (*Chem. & Met.*, 39, 1932, p. 673), the first of which involves interpolation which may introduce error. A second and more accurate chart of Nevitt covers a more limited range and requires a slide rule calculation for each conversion made.



This chart simplifies weight fraction—mol fraction conversions

VICTOR CHEMICAL WORKS JOINS IN NEW PLANT PROGRAM OF THE SOUTH

A further addition to the new chemical plant capacity of the South was announced last month when the Victor Chemical Works of Chicago made public its plans for expansion. The company has purchased 130 acres of land near Mount Pleasant, Tenn., and will proceed with the construction of a large electric furnace for the processing of phosphate rock. The new plant is to cost \$1,000,000 and will secure power from the Tennessee Valley Authority.

Announcement of a new pulp mill for Fernandina, Fla., also has been made. The new plant will be operated by the Fernandina Pulp and Paper Co., which was organized by Pacific Coast interests associated with the Rainier Pulp and Paper Co., the Olympic Forests Products Co., and the Gray's Harbor Pulp and Paper Co.

The site for the new mill comprises

175 acres fronting 2,000 ft. on Amelia River, Fernandina's harbor. The plans call for an expenditure of \$6,000,000. Construction has already started and this means that work on two large pulp and paper developments will go on simultaneously as the Kraft Corp., subsidiary of the Container Corp. of America already is constructing a \$7,000,000 mill at Fernandina.

Progress also has been made with the plans of companies previously announced. For instance the new phosphorus plant of the Monsanto Chemical Works, at Monsanto, Maury Co., Tenn., is reported to be in operation.

Hugh A. Galt, president of Southern Alkali Corp., announced a month ago that contracts had been let for the construction of a chlorine plant at Corpus Christi, Texas and it was expected that the new plant would be ready to go into production by the first of next January.

Chemical Exposition Sponsors Slogan Contest

A slogan contest with a first prize of \$250.00 in cash is announced by the management of the Sixteenth Exposition of Chemical Industries which will be held at Grand Central Palace, New York, Dec. 6 to 11, 1937. The object of the contest is to secure for the chemical and chemical process industries a brief descriptive expression encompassing their aims and suggesting their manifold benefits.

Eleven prizes in all, totaling \$300.00 will be awarded by the Sixteenth Exposition of Chemical Industries in this unusual contest. A first prize of \$250.00 in cash will be presented to the person submitting the slogan considered best in the opinion of the judges and there will be ten prizes of \$5.00 each for the ten next best slogans. The contest will be judged by a jury consisting of

members of the advisory committee of the exposition.

The slogan contest takes on an international aspect through the fact that it is open to any person residing in the United States, Canada or Mexico. Any number of suggested slogans may be submitted, providing certain rules as stated in the contest announcement are followed. The contest closes on Sept. 18. Awards will be announced as soon as practicable after the close of the contest and the actual presentation of the prizes will be made at the Exposition of Chemical Industries on Monday evening, Dec. 6.

In sponsoring this unique contest, the management of the Exposition of Chemical Industries hopes to provide a verbal rallying point or slogan which will be effective in symbolizing the accomplishments and coordinating the progress of the chemical industries as a whole. It is expected that the winning slogan or

slogans, which the Exposition management will make available to all units in the chemical industry, will be utilized in the advertising and publicity programs of a great many companies. The total effect, the sponsors believe, will be increased understanding of the scope of chemistry and chemical engineering as related to the progress of mankind.

Germany Uses Anthracene To Make Carbon Black

Continuing its efforts towards securing independence in its carbon black requirements, Germany has turned to anthracene as a raw material, according to a report from Consul Sydney B. Redecker, Frankfurt-on-Main.

About eighteen months ago Germany began the production of blacks from naphthalene and according to reports was successful in synthesizing a product equal to the best grades of American carbon black. To insure raw materials for the new industry the Government placed an embargo on certain grades of naphthalene and at the same time passed legislation requiring the use of the new product, particularly in the manufacture of automobile tires.

In 1936 Germany was reported to be producing naphthalene black at the rate of 12,000 metric tons per annum and that the domestic product was rapidly replacing imports. It appears now that Germany is finding the use of naphthalene too expensive owing to its scarcity and the heavy demand from other industries throughout the country and is turning to anthracene as a substitute. It is not known to what extent anthracene is being used in the manufacture of blacks in Germany but it appears that one plant known as the Russwerke Dortmund and a group of rubber tire manufacturers will utilize the process.

Notwithstanding Germany's efforts to produce carbon blacks by synthesis and the reported success in this direction, imports of gas blacks into that country increased to 3,520 metric tons during the first four months of the current year from 2,342 tons in the corresponding period of 1936.

Canadian Company Will Build New Radium Refinery

Dr. Marcel Pochon, French scientist who directs the refining and laboratory processes of Eldorado Gold Mines, Ltd., at Port Hope, Ont., Canada, has completed a survey which shows that nearly double the amount of radium now available is required if sufferers from cancer are to be properly treated. Hence the Canadian company will build a new refinery to be in operation by the end of the year and which will have a productive capacity about three times that of the present one.



New Westport mill to house modern research laboratories and test plant of the Dorr Co.

Dorr Company Dedicates New Westport Mill

Rising on the foundations of the old colonial grist mill at Westport, Conn., which had been destroyed by fire in 1927, are the new research laboratories and test plant of the Dorr Co. This modern successor of the ancient Westport mill was officially opened July 30 before about 200 engineers and industrialists who had been invited by John V. N. Dorr to participate in the unique ceremonies of dedication.

Sandwiched in between morning and afternoon golf sessions and a hearty picnic lunch served by the Dorr ladies of Westport, was a complete inspection of the modern research facilities of this four-story, greystone building. This was followed by an actual demonstration of some of the larger-scale experimental work which is conducted at Westport.

Almost 20 years ago Mr. Dorr conceived the idea that a research plant located in the country, away from the distractions of the city, offered the best place to work out the complex engineering problems of his own company and those put to him by his clients in metallurgical, chemical and sanitary fields. At that time he purchased the original Westport mill—a wooden structure, built more than a century ago at the confluence of the Saugatuck and Aspetuck Rivers. In a short time the Westport mill became a busy research center from which came many important developments in chemical and metallurgical engineering. When destroyed by fire April 9, 1927, the work was continued in several frame structures that were erected immediately on a nearby site along the old mill pond. But the charred foundations remained as a constant reminder of the fine history and conditions surrounding the old mill. Therefore, all who knew it in the old days were pleased to see that the new

structure retains the quaint, early Connecticut character and appearance of the original mill. Even the old head gate and tail race have been retained and still serve effectively for furnishing the large volumes of water required for some of the hydraulic studies.

Within the mill, the arrangement is entirely modern and adapted to present-day research needs. The analytical laboratories are separated from the research which are in turn isolated to permit specialization of work on different projects. The hydraulic laboratory in the basement is in reality a semi-commercial scale plant, capable of treating up to 50 tons a day of an ore or chemical raw material or the treatment of several million gallons of water.

It was here that the research director, George Darby, assisted by Dr. E. J. Roberts and a corps of other specialists, put on their demonstration of typical experiments. These included water treatment to remove turbidity and suspended solids, closed-circuit grinding and classification of a special grade of silica sand and a unique process of cement rock flotation which permitted the original raw material to be separated into its individual constituents, (calcite, quartz, mica, etc.). These constituents, recombined in proper proportions, make it possible to manufacture different types of cement with properties that could not be obtained from the original cement rock without such beneficiation.

Food Conference at M.I.T. In September

Recognizing the common bonds of technology that run through all food manufacturing industries, Massachusetts Institute of Technology will hold a three day conference on food engineering at Cambridge, Mass., Sept. 14-17. A cooperative meeting of the New Eng-

land branch of the American Society of Refrigerating Engineers will also be held at this time. A program of more than thirty papers will include the technology of canning, the application of low temperatures in food handling, and advances in dairy manufactures. According to Dr. S. C. Prescott, dean of science at M.I.T. this will be the first general conference ever to emphasize the growing interest in the new profession of Food Engineering. Chemists, engineers, and research workers in food plants are urged to participate.

Domestic Nitrogen Business Shows Expansion

The nitrogen business of America continued to grow last year, with synthetic nitrogen products occupying first place in importance of supply. The following summary gives, in thousands of net tons of nitrogen contained, the production, imports, exports, and apparent consumption:

	Thousand Net Tons of Nitrogen Contained
Production:	
Byproduct	144
Synthetic	185
Total Produced	329
Imports:	
Fertilizer materials	180
Industrial chemicals	6
Total imports	186
Total available.....	515
Exports:	
Fertilizers	50
Industrial materials	2
Total Exports	52
Apparent Consumption	463

Data are not yet available in sufficient quantity to permit estimate of the consumption of the synthetic nitrogen products made last year, but *Chem. and Met.* has prepared an estimate based on the operations of 1935. The following tabulation indicates the approximate disposition of the synthetic ammonia, which is the primary product of air fixation, in industrial and fertilizer uses. All of these data are expressed in thousands of net tons of contained nitrogen.

	Thousand Net Tons of Nitrogen Contained
Non-Fertilizer Uses:	
Nitric acid	17
Explosives	20
Ammonium salts and other industrial chemicals.....	12
Soda ash manufacture.....	4
Refrigeration	3
Total	56
Fertilizer Uses:	
Ammonia, used as such*....	25
Urea, NH_4NO_3 , $(\text{NH}_4)_2\text{SO}_4$, and related compounds....	23
Sodium nitrate synthetic†..	70
Total	118
Grand total.....	174

*The ammonia in mixtures with urea or ammonium nitrate is here included, but not the nitrogen content of the urea or nitrate.

† Includes synthetic production exported.

FUTURE LEGISLATION in Washington will depend on what the members of Congress hear "back home" during the fall recess. The voice of the people still is potent. There can be no more convincing proof of this than the defeat of the President in his great Supreme Court packing battle. Conservatives of Washington rejoice in this evidence that "democracy is not entirely stifled." But this emphasis on the influence of the voters cannot safely be taken to mean that the President has lost control altogether, nor that the desire and demand for reform are any less. The list of measures to centralize control in the executive departments of Washington is no shorter, and the desire to control the courts no less.

Some pessimists opine that the great court battle merely necessitates more careful bill drafting for Congress, because it will not be quite so easy with a nine-man bench to procure favorable judgments on the reform measures that seem sure to pass. That view is, however, probably over-pessimistic, because the Administration measures considered during the latter part of July and early August could gain a majority vote in either House only when far less comprehensive and drastic than the requests of the President.

Trade Rules

Initial decisions under the Robinson-Patman Law by Federal Trade Commission were promulgated during July. Any enterprise materially concerned with the interpretations of this important merchandising Act must study all of these decisions with great care. Not only those which represent further prosecution of cases are important, but also those which, in effect, exempt certain classes of manufacturers from direct limitation in pricing. Friendly comment on these decisions indicates that a "very reasonable" attitude is being taken by the Commission. But there is nothing to indicate a desire to sidestep responsibility where marginal cases appear to require court finding.

Most encouraging to the chemical industry of these decisions will probably be the clear recognition that sales of a commodity to a single large customer at a price much lower than those for goods, sold to minor customers *may* be fully justified by the much reduced cost of selling. Almost equally interesting to small high-cost producers is the decision that quantity discounts similar to those prevalent in an industry are not necessarily forbidden by this act, because they do not lessen competition when made by an individual manufacturer who sells generally at prices higher than most of his competitors.

The test of influence on competition remains dominant in most of the cases announced. This apparently is rather essential under the present law. Thus

NEWS FROM WASHINGTON



Washington News Bureau
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Paul Wooton, Chief

far F.T.C. has not been given the much desired authority to prosecute undesirable trade practices without demonstrating that they have a material influence on competition. But Washington confidently expects such authority and other wanted extensions of power will be given the Commission before the present Congress expires next year. Trade practice regulation will be pressed by the Administration vigorously.

Sugar and Molasses

Whatever the immediate outcome of sugar tax battles, the cost of sweetening America will certainly be increased before long; and if the corn state representatives have their way, alcohol costs will also advance significantly. The situation is so complex as to preclude useful forecasting at this time. But it appears that when (or if) the Administration program of sugar control is complete, the plan will unavoidably include some additional tax on industrial molasses. Without the votes of corn-state Congressmen the Administration cannot force through the sugar bill; and these votes must be bought with further penalty on corn's competitors in the alcohol industry.

Technical interpretation of this situation immediately points to increased substitution of other industrial solvents for alcohol. Some increase in cost of alcoholic beverages will also follow, if the corn spokesmen succeed in requiring only *grain* alcohol for beverage use. The alcohol industry seems due to suffer significantly; and alcohol's competitors, though not supporting this measure in any way, are bound to benefit.

T.V.A. Power

Two more important power contracts have been announced recently by T.V.A. Under one of these a generous block of power will be sold to Arkansas Light & Power Co. Under the other Victor Chemical Works will process phosphate

rock at a new electrochemical plant to be built in Maury County.

Announcement of the Victor-T.V.A. contract apparently indicates that the two firms who have been most important in manufacture of industrial phosphoric acid products are undertaking, by using T.V.A. power (and methods?), to retain their position in this highly competitive field. Washington has heard many rumors about newcomers contemplating plants in the Valley, but now believes that phosphoric acid developments in this area are likely to be limited to these two going concerns, Victor and Monsanto.

The new Victor contract provides for energy supply stepping up as high as 32,000 kilowatts by 1941, running for a twenty-year period. Equal quantities of primary and secondary (run-of-river) power will be utilized.

Imitation of the T.V.A. system by establishing seven regional power authorities has not met with favor in Congress. Renewal of the battle for this dream of Senator Norris is expected next year.

Depletion Charges

In attacking those who escape federal tax burdens by legal avoidance methods, the Secretary of the Treasury listed as one of the principal loopholes the present schemes for charging off depletion, especially on mineral properties. This major "loophole" will not be plugged this year, but it is expected that the Treasury experts will present an elaborate argument next winter by which they hope to secure limitation of depletion allowances in calculating corporation income tax. Although this corrective measure will be directed primarily at mining and petroleum enterprises, a secondary effect on chemical process industry would not be surprising.

Limitation on scrap export as a measure of neutrality has achieved no important backing in Congress during the past several months. It appears, as the session wanes, that spectacular claims made as to the importance of limiting metal and mineral trades for the maintenance of peace have collapsed under the spotlight of fact. There is even some talk that the cash-and-carry neutrality policy fixed by law last winter will have to be fundamentally modified next winter, lest the United States be drawn into a serious partisan position in the Far East.

Stream pollution control by federal agencies goes over to the next session of Congress, with a growing emphasis on the cooperative Public Health Service plan. The elevation to Senate leadership of Senator Barkley, who backed this plan against the Loneragan rigid control measure, encourages industrial spokesmen in Washington to believe that the Vinson-Barkley program can be enacted next year.

RECORD PRODUCTION OF DYESTUFFS FOR GREAT BRITAIN LAST YEAR

From Our London Correspondent

A STATISTICAL summary from the Board of Trade shows a new record was established in dyestuffs manufacture in the United Kingdom during 1936. The expansion has taken place particularly in direct cotton colors, the output of which has increased from 10.5 million pounds in 1935 to 11.4 million pounds in 1936. A growing demand for special dyestuffs for cellulose acetate silk is also evident in the increase of this particular group from 1.8 million pounds (1935) to 2.2 million pounds (1936). The total 1936 output of synthetic organic dyestuffs, so far as can be ascertained from the returns of the principal British dyemakers, amounted to 61.2 million pounds, compared with 58.7 million pounds in 1935 and 52.9 million pounds in 1934. Blacks and blues predominated at a total of 36.6 million pounds; of the remainder, reds amounted to 8.0 million pounds. Vat blues, which include synthetic indigo, accounted for 11.2 per cent of the total synthetic dyestuffs production.

The subject of the fastness of dyestuffs on commercial textiles received attention at the annual conference of the Textile Institute early in June. In one paper, C. M. Whittaker, of Courtaulds, Ltd., stressed the fact that while dyestuffs makers refused to guarantee the fastness of their products, the dyers continued to do so and they were increasingly degrading that guarantee by using direct cotton colors which were not comparable with the best vat dyestuffs. One result of this trend of the dyeing trade was that increasing quantities of case-moment fabrics of inferior fastness to light and washing were coming on the market.

The extent of petroleum refining operations in the United Kingdom during 1936 has also been recently revealed in statistics published by the Board of Trade, from which it is evident that considerable changes have taken place in the order of importance for sources of crude oil. For instance, Iran, which occupied the second place on the list in 1935 with 91.4 million gallons, dropped to fourth place in 1936 with 78.9 million gallons; Mexico changed from third to seventh place; Iraq, continued to hold first place, with consignments increased from 136 to 148 million gallons. The first place, however, is more correctly held by Venezuela at a true total of 170 million gallons, including 106 million gallons from the Dutch West Indies which is of Venezuelan origin. The total throughout of the refineries was 607 million gallons, or 33.6

million gallons more than in 1935; of this total, crude petroleum accounted for 486.7 million gallons and shale oil 30.4 million gallons, the remainder being partially refined products. The output of gas oil increased by 23.3 per cent, kerosene 11 per cent, fuel and Diesel oil 6.0 per cent, and lubricating oils 3.5 per cent.

Chemical Output Increases

According to a recent statement in Parliament reviewing the British trade position, the output of chemicals has been greater than at any previous time in the history of the country. Production of sulphuric acid (in terms of a product of 70 per cent strength) during the first quarter of 1936 was 294,500 tons by the chamber process and 115,600 tons by the contact process. In the chemical market there has been a pronounced shortage of tar acids, the prices for which have risen to new high levels; flake naphthalene also has been scarce. In addition, there has been a sustained demand and shortage of supplies of cadmium metal, and a pronounced demand for sodium chlorate to meet the seasonal consumption as a weed killer.

The Government is proposing to assist farmers in raising the fertility of the soil by increased use of lime. They also consider it desirable to secure increased application of basic slag to grasslands, and have, therefore, proposed that, for a limited period of years, the cost to the farmer of lime and basic slag should be reduced by approximately 50 per cent and 25 per cent respectively. In other words, a government subsidy is proposed for these products when used for agricultural purposes. Other legislation of interest to the chemical industry at present before Parliament includes trade marks, and the discharge of trade effluents into public sewers. One particular clause of the Trade Marks (Amendment) Bill concerns the assignment and transfer of trade marks; it is of special interest to British companies which have unwittingly jeopardized the validity of important trade marks by following American and Continental methods in dividing the manufacturing and distributing activities of their business between parent and subsidiary companies.

According to the recently published Annual Report of the Chief Inspector of Alkali, etc., Works, there were 978 registered works at which 1,850 separate processes were in operation during 1936. Expansion in the paper and rayon

industries has resulted in an increased consumption of carbon bisulphide, chlorine, bleaching powder, and sulphuric acid. Among organic solvents there has been a notable increase in the use of carbon tetrachloride and trichlorethylene for metal degreasing and for textile dry cleaning. The number of sulphuric acid works in the country (74) shows a reduction of four by comparison with 1935. Production of sulphuric acid at 867,000 tons, increased by nearly 10 per cent on the total for 1935, but even so, only about 81 per cent of the available plant capacity was in use. The tar distilling industry has been maintained at a high level, mainly due to the exceptional demand for creosote and naphthalene, which offset a severe slump in pitch.

On the occasion of a visit to the Government Fuel Research Station at East Greenwich, London, when several hundred industrialists were the guests of the Department of Scientific and Industrial Research, it was revealed that methods have been worked out by which aviation spirits can be produced instead of ordinary motor spirits by hydrogenation of coal or tar. It was stated that it has been found possible to obtain a volume of spirits equal to that of the low temperature tar which is treated, and that 140 gallons of spirits have been produced by the hydrogenation of one ton of coal.

Industrial developments continue to be active. The British Oxygen Co., Ltd., who are the largest importers and also the largest users of calcium carbide in the United Kingdom are interested in a scheme of manufacture which they have submitted to the Government Calcium Carbide Committee. Recent demands for synthetic resin molding powders have exceeded the manufacturing capacity of British Industrial Plastics, Ltd., who have had to extend their plant. Imperial Chemical Industries, Ltd., are establishing a new plant at Welwyn Garden City for the large scale manufacture of synthetic resins and molding powders by their subsidiary, Mouldrite, Ltd. The new distillery at Dumbarton is gradually reaching completion, and is expected to be in operation by the commencement of 1938. The plant, which will have an annual capacity of 2 to 3 million proof gallons, is to be operated by Dumbarton Distillery, Ltd., (capital £600,000) a subsidiary of Hiram, Walker, Gooderham and Worts, of Canada. Minor new manufactures include ethylmethyl phenyl glycidate ("strawberry aldehyde" essence) by A. Boake, Roberts and Co., Ltd., of Stratford, London. A new factory has commenced operations at Whitehouse, near Belfast, Northern Ireland, for the extraction of nicotine from tobacco waste, with the eventual production of nicotine-containing fumigants, insecticides, sheep dips, and other products of similar nature and use.

Production and Sales of Coal-Tar Crudes at Byproduct Coke Plants and Tar Refineries, 1936 ¹

Tar distilled ²	Oil-gas tar.....	3,481,764 gallons — \$	211,315
	Water-gas tar.....	26,682,899 " —	1,097,143
	Coal-tar.....	292,140,249 " —	14,867,487
		322,284,912	\$16,175,955

	Unit of quantity	Production quantity	Sales		Unit value
			Quantity	Value	
Tar ³	Gallon	580,385,578	358,182,759	\$15,328,340	\$0.043
Light oil and derivatives:					
Crude light oil ⁴	"	170,234,202	10,363,176	971,764	.094
Benzol (except motor benzol) ⁵	"	19,412,593	19,145,088	2,675,932	.140
Motor benzol ⁶	"	85,672,953	84,761,655	7,628,935	.090
Toluol, crude and refined ⁷	"	19,807,383	19,695,792	5,403,424	.274
Solvent naphtha ⁸	"	5,189,232	4,961,433	916,505	.185
Xylo ⁹	"	4,216,081	4,206,525	1,121,032	.266
Other light oil products ¹⁰	"	12,930,846	7,803,655	1,293,114	.166
Naphthalene, crude and refined ¹¹	Pound	89,536,202	74,053,605	1,466,467	.020
Crude tar acids ¹²	Gallon	14,390,685	1,330,715	182,908	.137
Creosote oil.....	"	101,758,256	93,215,599	10,294,159	.110
Tars, crude and refined ¹³	"	19,273,185	18,584,715	1,467,847	.079
Tars, road ¹⁴	"	140,759,387	140,367,418	11,303,496	.081
Other distillates ¹⁵	"	16,219,231	6,766,387	1,057,100	.156
Pitch of tar.....	Ton	451,532	365,390	4,597,213	12.58
Pitch of tar coke ¹⁶	"	91,229	74,664	849,336	11.38

¹ Data for coke ovens reporting to Bureau of Mines, and for tar refineries and others reporting to the United States Tariff Commission, unless otherwise noted.
² Reported to the United States Tariff Commission only.
³ Reported to the Bureau of Mines only.
⁴ Includes other light oil products of the Bureau of Mines and all of the light oil products reported to the United States Tariff Commission.
⁵ Includes crude and refined naphthalene reported to the Bureau of Mines and crude naphthalene reported to the United States Tariff Commission.
⁶ Includes phenol and sodium phenolate reported to the Bureau of Mines.

Increase in Naval Stores Production Last Year

Naval stores producers made 55,471 barrels of rosin and 31,612 barrels of turpentine more during the 1936-37 season than they made the previous season, according to the U. S. Department of Agriculture's annual report on production, consumption, and stocks of naval stores. The carryover of both turpentine and rosin was less at the beginning of the new season on April 1, 1937 than it was for the corresponding period last year.

The increase, according to Dr. F. P. Veitch in charge of the Naval Stores Research Division of the Bureau of Chemistry and Soils, is due to increased production of wood naval stores produced by steaming old pine stumps and extracting the rosin with a solvent. There was actually a decrease in the production of gum naval stores, made from the oleoresin or gum which exudes from living pine trees.

The producers of gum naval stores reduced their production from 497,000 bbl. of turpentine and 1,647,000 bbl. of rosin in 1935-36 to 482,787 bbls. of turpentine and 1,565,240 bbl. of rosin in 1936-37. The total production of all classes of naval stores for the 1936-37 season was 634,520 bbl. of turpentine and 2,331,962 bbl. of rosin compared with 602,908 bbl. of turpentine and 2,276,491 bbl. of rosin in 1935-36. Turpentine barrels hold 50 gallons and rosin weighs approximately 500 gross pounds per barrel.

CALENDAR

AMERICAN CHEMICAL SOCIETY, semi-annual meeting, Rochester, N. Y., September 6-10.

AMERICAN GAS ASSOCIATION, annual convention, Cleveland, Ohio, September 27-October 1.

CHICAGO EXPOSITION OF POWER AND MECHANICAL ENGINEERING, International Amphitheater, Chicago, Ill., October 4-9.

ELECTROCHEMICAL SOCIETY, fall meeting, St. Louis, Mo., October 13-16.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, fall meeting, Savannah, Ga., October 18-20.

AMERICAN PETROLEUM INSTITUTE, annual meeting, Chicago, Ill., November 8-12.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, annual meeting, St. Louis, Mo., November 17-19.

16TH CHEMICAL EXPOSITION, Grand Central Palace, New York City, December 6-11.

AMERICAN CHEMICAL SOCIETY, semi-annual meeting, Dallas, Texas, April 18-21, 1938.

Lead and Zinc Pigment Sales in 1936

Sales of all lead and zinc pigments and zinc salts in the United States in 1936 increased 14 per cent over 1935 in both value and tonnage, according to a report of the United States Bureau of Mines, reflecting the greater demand for paint, automobiles, pneumatic tires and storage batteries, all major pigment consuming industries. The total of sales for 1936 was 581,537 short tons, valued at \$62,455,699, compared with 510,355 tons, valued at \$54,888,755 in 1935.

Total sales of lead pigments increased 22 per cent in value and 16 per cent in quantity, whereas zinc pigments increased only 5 per cent in total value and 13 per cent in quantity. Producers of lead pigments received nearly \$7 per ton more for their product in 1936 than in 1935, while zinc pigments brought \$6 less per ton.

Comparison of the sales of the white lead pigments and zinc oxides to the paint trade in recent years reveals substantial gains in the use of leaded zinc oxide. In 1932, total sales amounted to 105,529 short tons of which white and sublimed lead accounted for 66 per cent, zinc oxide 21 per cent, and leaded zinc oxide only 13 per cent. By 1936, total sales had increased to 194,792 tons, of which the lead pigments supplied 62 per cent, zinc oxide 17 per cent, and leaded zinc oxide 21 per cent. For the same period the average lead content of the latter pigment increased from 23 to 27 per cent and production nearly trebled.

New Denaturing Rules for Ethyl Acetate

Under date of July 16, a Treasury Decision proclaimed that effective immediately ethyl acetate must be denatured before being removed from the premises of the manufacturer, by adding to every 100 gallons of ethyl acetate one-eighth gallon of calol ethata'e, or other products or chemicals which possess denaturing properties satisfactory to the commissioner; Provided, That ethyl acetate used as a denaturant for specially denatured alcohol or for pharmaceutical, scientific, and food preparations, or where it is exported, or transferred from one producer to another producer need not be denatured.

Any manufacturer desiring to purchase ethyl acetate denatured with products or chemicals in lieu of calol ethataate shall make application to the commissioner showing in detail for what purpose the ethyl acetate is to be used, and why they cannot use such material denatured with calol ethataate. The application should show the kind and quantity of products of chemicals that the purchaser of ethyl acetate desires to be substituted for calol ethataate.

PERSONALITIES

♦ ALLEN ABRAMS, director of research for Marathon Paper Mills Co., Rothschild, Wis., and past president of T.A.P.P.I., has received the honorary degree of Doctor of Science from Washington and Jefferson University.

♦ LEO H. BAEKELAND received the high honorary degree of Doctor of Law from the University of Edinburgh, Scotland, last month.

♦ WALTER BASS, winner of this year's A.I.Ch.E. Student Problem Contest, is now employed by the Lummus Co., New York City. Mr. Bass received his degree in chemical engineering from Cooper Union this year.

♦ R. H. BLISS, Ph.D. Yale '35, has accepted a position as assistant professor of chemical engineering at the University of Pennsylvania.

♦ CHAS F. BONILLA, formerly chemical engineering instructor at New York City College, has accepted a teaching position at Johns Hopkins University.



Julian L. Schueler

♦ JULIAN L. SCHUELER has been named general superintendent of the Continental Steel Corp., Kokomo, Ind. Mr. Schueler was formerly superintendent of the steel and wire division of the company.

♦ MELVIN E. CLARK has recently joined the staff of *Chem. & Met.* as an edi-

torial assistant. Mr. Clark is a graduate in chemical engineering of the University of Colorado and last year was editor of the *Colorado Engineer*.

♦ ALBERT H. COOPER, formerly of the chemical engineering faculty of North Carolina State College is now associate professor of chemical engineering at Virginia Polytechnic Institute.

♦ CLARKE E. DAVIS, vice-president of Virginia Dare Extract Co., was elected vice-president of the Flavoring Extract Manufacturers Association at its convention in Chicago.

♦ R. J. HAWN, director of manufacture for several of the plants of the Monsanto Chemical Co., has been elected vice-president of that company. Mr. Hawn was a vice-president of Swann Chemical Co. prior to its absorption by Monsanto in 1935.

♦ WALTER L. PENICK, formerly western manager for the Hardinge Co., has joined the Western Precipitation Corp. of Los Angeles as field consultant on dust and fume control problems.

♦ CURT PIETRUSKY of Chicago has completed 40 years of service as American correspondent for the German chemical journal, *Chemiker-Zeitung*.

♦ JAMES T. MACKENZIE, chief metallurgist for the American Cast Iron Pipe Co., has been selected by the American Foundrymen's Association to present its official exchange paper before the 1938 meeting of the Institute of British Foundrymen.

♦ GUILLIAM H. CLAMER, president of the Ajax Metal Co., and GUSTAVE W. THOMPSON, chief chemist and director of the National Lead Co., have been awarded honorary memberships in the American Society for Testing Materials in recognition of their eminence in the field of engineering materials and their service to A.S.T.M.

♦ MARSTON TAYLOR BOGERT, professor of organic chemistry at Columbia University and past president of the American Chemical Society, has been elected



Lloyd Logan

Honorary Fellow of the Royal Society of Edinburgh, Scotland.

♦ LLOYD LOGAN has been appointed professor of chemical engineering and head of that department at Syracuse University to succeed Dr. Albert Salathe, who resigned last spring. Dr. Logan has been a member of the chemical engineering faculty of Johns Hopkins University for the past ten years.

♦ MATTHEW VAN SICLEN has been named chief of the coal statistics division of the economics branch, U. S. Bureau of Mines. He succeeds F. G. Tryon, who now heads the statistical and economics unit of the National Bituminous Coal Commission.

OBITUARY

♦ H. H. DUGDALE, vice-president in charge of sales, American Gas Products Corp., died in New York City on July 19.

♦ WALTER E. NEWBERT, for many years a prominent figure in the dyestuffs, and chemical industry and lately associated with the American Cyanamid & Chemical Corp., died at his home in Waban, Mass., on July 24. Mr. Newbert was for a time president of the Newbert Color Co., Boston.

CHEMICAL CONSUMING INDUSTRIES STILL RELATIVELY QUIET

FOLLOWING a six-month period of unusually high production in general industrial lines, a curtailment in production schedules has been put into effect in many industries. Different factors have contributed in bringing about this revision. Seasonal influences, labor troubles, stimulation of earlier activities to offset prospective price increases, all these have had some bearing on the situation.

The factor which loomed up a few months ago as of first importance in affecting the course of business in the second half of the year was connected with labor. The influence of labor is still important but fears regarding widespread troubles have subsided and prospects for business in the closing months of the year are bright.

So far as the chemical industry is concerned, it has followed the general trend from the end of June to date. Consuming industries have not been in the market to any extent for fresh supplies of chemical raw materials and unquestionably have used less chemicals in manufacturing than was the case in the months immediately preceding. However, the major part of consumers of chemicals are covered by contracts and only seasonal slowness has been reported for contract deliveries as a whole.

The textile industry, all branches of which have been active for the year to date, fell off somewhat in the last two months. Wool consumption in June averaged 5,011,000 lb., scoured, weekly, as compared with 5,716,000 lb. in each week of the previous month and a weekly average of 5,763,000 lb. for the last twelve months.

Consumption of pulled wool in June averaged 1,313,000 lb., greasy basis, weekly, as against 1,588,000 lb. weekly in May and a weekly average of 1,566,000 lb. in the last twelve months.

Silk mills have been feeling the effects of labor demands and receipts of silk at domestic mills in July amounted to but 31,399 bales or more than 5,000 bales less than in July, 1936. It is also probable that silk deliveries to mills in

August will fall considerably below those of the corresponding period of last year.

Reflecting the more favorable position of consuming lines, notably paint and varnish, oilcloth, linoleum, and printing ink, production of linseed oil in the quarter ended June 30 was 206,511,823 lb. compared with 100,118,519 lb. in like quarter of 1936.

Statistics now available for different branches of the glass trade show that production has held universally higher than a year ago. In July reports from the flat glass branch of the industry indicated that only a moderate change in schedule has been made owing to a desire to accumulate reserve supplies.

According to the monthly joint study of the National Association of Credit Men and the Bureau of Foreign and Domestic Commerce, total sales of manufacturers in June showed notable improvement over those for June 1936. This was a continuation of the gains in sales recorded for this group for each month of the present year as compared with the corresponding months of last year. Sales of the 547 manufacturers represented in the reporting group registered an increase of 11.7 per cent over June 1936 and a decline of 7.5 per cent from the total for May 1937.

Details for some of the industries show the following percentage changes

in sales for June compared with June 1936 and with May 1937: chemicals and allied products, up 16 and down 3.9; paint and varnish, up 14.2 and up 2.5; pharmaceuticals, up 2.6 and up 1.3; petroleum products, up 15.7 and up 1.1; rubber products, up 26.9 and up 3.9; leather and its products, up 31 and down 0.7; stone, clay and glass products, up 23.3 and up 2.3; paper and allied products, up 54.7 and down 1.6.

Spanish military disturbances have thus far caused more mental anguish than actual monetary damage to American quicksilver users. One recent result of the renewed interest in quicksilver has been the release by the U. S. Geological Survey of advance copies of a map showing the ownership of lands in the Arkansas quicksilver area. The full report on this territory will ultimately appear as Bulletin 886-C, prospectively some months hence.

Consolidation of ownership of land in this area appears to be going on, and it is reported to the Government that new outside money has become available for further development. This is believed to be an advantageous change, because much of the area does not seem likely to be successfully developed on a very small scale by selective hand-sorting methods.

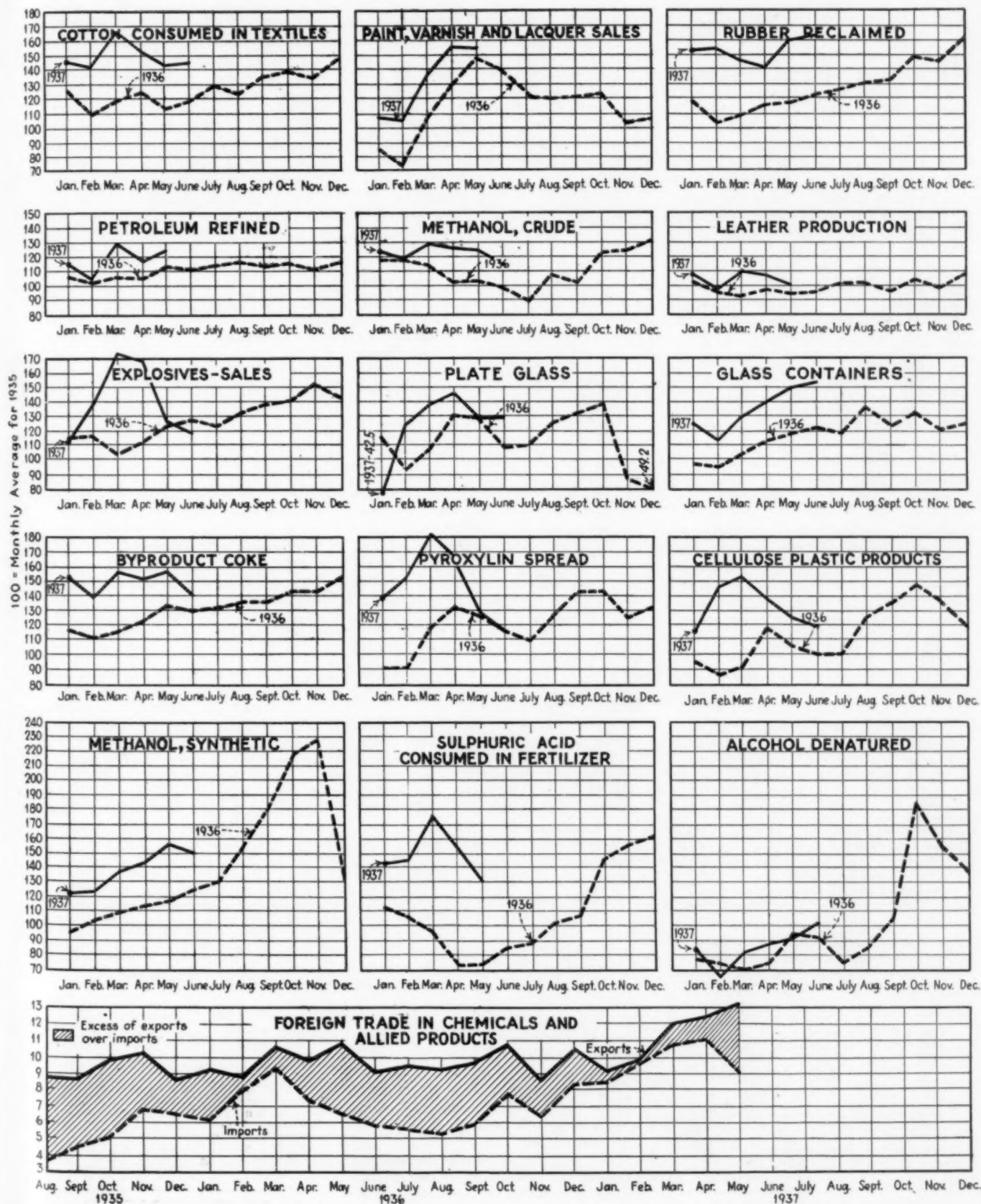
Survey geologists are working actively in some of the other areas where quicksilver prospects seem worth investigating, but no special or intensive drive has been undertaken, because of limited funds available for this type of study. Officials agree, however, that more intensive investigation of this and several other deficiency minerals would be very much worth while, especially at this time. The significance of such study is just as great with reference to problems of commercial relations in international trade as to those of military preparedness. As a matter of fact, preparedness is rather a poor argument for some of the most promising studies, which really bear on questions of economic supply of mineral raw material for American industry in peace time.

Production and Consumption Data for Chemical-Consuming Industries

	June, 1937	June, 1936	Jan.-June, 1937	Jan.-June, 1936	Gain for 1937 per cent
PRODUCTION					
Alcohol, denatured, 1,000 wi. gal.	8,325	7,454	41,761	38,975	7.0
Ammonia, tons*	64,093	58,858	410,967	327,067	25.6
Automobiles, number	497,298	452,968	2,788,849	2,488,560	12.6
Benzol, 1,000 gal.	9,517	9,148	60,921	49,890	22.1
Byproduct coke, 1,000 tons	4,024	3,695	25,695	20,622	24.6
Cellulose acetate plastics, 1,000 lb.	1,113	1,061	6,268	4,534	38.2
Nitrocellulose plastics, 1,000 lb.	1,536	1,154	8,713	6,318	37.8
Glass containers, 1,000 gr.	4,980	3,889	26,493	20,812	27.3
Plate glass, 1,000 sq. ft.	19,392	16,244	106,577	102,081	4.4
Methanol, crude, 1,000 gal.	486	414	3,113	2,732	13.9
Methanol, synthetic, 1,000 gal.	2,264	1,863	12,513	9,902	26.4
Pyroxylin spread, 1,000 lb.	4,958	4,930	37,935	28,966	30.9
Rosin, wood, bbl.	63,428	52,418	367,204	316,442	16.0
Turpentine, wood, bbl.	9,208	8,093	57,218	51,753	10.5
Rubber reclaimed, tons	16,052	11,256	90,512	66,715	35.5
CONSUMPTION					
Cotton, 1,000 bales	681	555	4,190	3,320	26.2
Silk, bales	35,783	31,437	234,228	205,136	14.2
Explosives, sales, 1,000 lb.	29,427	30,394	202,273	161,002	25.7
Rubber, crude, tons	51,798	52,772	312,097	283,700	10.0

* Sulphate equivalent of byproduct coke production.

TRENDS OF PRODUCTION AND CONSUMPTION



CHEMICAL MARKET PASSING THROUGH QUIET PERIOD

QUIET conditions have prevailed in the market for chemicals in recent weeks. In the first place there has been some recession in the rate of operations in some of the consuming industries and there have been some accumulations of raw materials in consumers hands which have tended to cut down recent buying. Some improvement in trading was reported as August advanced and belief in large consumption of chemicals during the last four months of the year is still maintained. A brief summary of the year to date finds an active movement of chemicals for the first half of the year, followed by some slowing up through the hot-weather period which in turn is giving way to a more active period.

Prices as a rule have maintained a steady position over the last month. Advances which became operative on July 1 are still effective and for most selections prices appear to be well established. Spirits of turpentine have sold at lower levels and a few of the chemical specialties have been offered at concessions but lead oxides and tin salts have been marked up and nitrate of soda for forward deliveries is higher. In a general way, price movements for the majority of heavy chemicals appear to be slated for a horizontal course for the next few months. The lead, zinc, and tin markets are firm at present and are expected to go higher with the probability that the salts will follow the course of the metals. Alcohol is threatened with a tax on black strap molasses which, if made effective, would force an increase in quotations for industrial alcohol. It is difficult to pick out any group of chemicals or any chemical of importance and find valid reasons for predicting a decline in price.

CHEM. & MET. Weighted Index of CHEMICAL PRICES

Base=100 for 1927

This month	90.00
Last month	90.14
August, 1936	86.36
August, 1935	87.56

With prices for most chemicals fixed for the current quarter, there was little of price significance to trading. Weakness in solvents, notably spirits of turpentine brought the weighted index number down slightly. In general, prices were steady.

The weighted index number for chemicals advanced rather sharply in July and fell back slightly in the present month but this is certainly no indication of a declining trend as indications are that higher rather than lower prices are probable.

Revision of its specifications for tertiary butyl alcohol was announced on July 27 by the Bureau of Internal Revenue. In a notice to district supervisors, authorized chemists, and others concerned, Deputy Commissioner Steward Berkshire announced that, effective at once, the revised specifications are adopted "for tertiary butyl alcohol authorized as a denaturant for specifically denatured alcohol formulae Nos. 39, 39-A, 39-B, and 40 in Treasury decision 4378, effective October 1, 1935."

Trading in linseed oil for future deliveries will be formally opened on Wednesday morning, Sept. 1. The contract is for 60,000 pounds of bulk linseed oil of New York Produce Exchange contract grade, which shall be raw linseed oil and conform to the standard specifications, as to "properties," adopted by the American Society for Testing Materials under the designation D-234-28. These specifications provide among other things that the oil shall be pure oil pressed from flaxseed.

Quotations will be in cents and hundredths of a cent per pound, each hundredth of a cent representing \$6 per contract.

A new company, known as Plant Protection, Ltd., has been organized in England for the purpose of coordinating sales, manufacture and national distribution of insecticides and other agricultural chemicals produced by two leading British companies.

Due to increased sales both in domestic and foreign markets, Germany's output of pyroxylin plastics (celluloid) has gained substantially in recent years, according to reports from Frankfurt-on-Main. One of the leading producers reported heavy gains in 1936 in its production of collodion cotton for manufacturing "celluloid" as well as for lacquers, artificial leather and firms. Exports of pyroxylin plastics from Germany were recorded at 2,317 metric tons in 1936, against 1,824 tons during 1935 and in the first four months of the current year exports reached 1,010 metric tons. These export gains, however, were achieved through drastic price reductions.

Due to increased world demand for liquid rosin, Swedish output and exports of this product have increased rapidly

in recent years—exports last year reaching 12,702 metric tons, against 8,418 in 1935 and 5,043 metric tons in 1932. Data indicates that practically the entire output is exported.

A new Austrian decree which became effective in July and runs until 1940 prohibits the establishment of new plants for the production of rosin and turpentine from pine rosin or putting into operation of plants that have been idle for six months or more, reports from Vienna state. Existing plants may not exceed their average output for the past three years.

Hungarian soap factories have entered into an agreement with the Government to use sunflower oil, utilizing the entire domestic crop, as a substitute for imported fish oils, according to reports from Budapest.

Fertilizer Minerals

Consumption of nitrates, potash, and phosphate in the fertilizer industry of the United States was greater during the fertilizer year just closed (June 30) than in any previous year on record. The actual tonnage of fertilizer sold is estimated by National Fertilizer Association to have been 8,005,000 tons. But it is evident that the concentration of plant food in this tonnage was much greater than during the year 1929-30, when the peak of 8,234,000 tons of fertilizer were sold.

With the aid of growing agricultural income and soil improvement contracts with the Department of Agriculture, farmers are continuing to contract for still larger tonnage of plant food for Fall and Winter use. Producers of fertilizer are therefore expecting again to do a record business during the coming season. Incidentally, National Fertilizer Association calculates agricultural income in terms of farm buying power as over 10% greater than in years of maximum farm income, 1927 to 1929. The dollar income is, of course, slightly less; but the cost of fertilizer is enough lower than in boom years to give the result indicated.

CHEM. & MET. Weighted Index of Prices for OILS AND FATS

Base=100 for 1927

This month	88.80
Last month	92.77
August, 1936	90.92
August, 1935	85.10

With crude cottonseed oil offered more freely and at lower prices the price tone for the oil market became easier. Linseed oil, however, with a very short domestic seed crop, has held a firmer position. China wood oil has sold off a little.

INDUSTRIAL CHEMICALS

	Current Price	Last Month	Last Year
Acetone, drums, lb.	\$0.06-\$0.07	\$0.06-\$0.07	\$0.08-\$0.09
Acid, acetic, 28%, bbl., cwt.	2.53-2.78	2.53-2.78	2.45-2.70
Glacial 99%, drums	8.70-8.95	8.70-8.95	8.43-8.68
U. S. P. reagent	10.75-11.00	10.75-11.00	10.52-10.77
Boric, bbl., ton	105.00-115.00	105.00-115.00	105.00-115.00
Citric, kegs, lb.	.25-.28	.25-.28	.26-.29
Formic, bbl., ton	.11-.11½	.11-.11½	.11-.11½
Gallio, tech., bbl., lb.	.60-.65	.60-.65	.60-.65
Hydrofluoric 30% carb., lb.	.07-.07½	.07-.07½	.07-.07½
Lactic, 44%, tech., light, bbl., lb.	.06½-.06½	.06½-.06½	.11½-.12
Muriatic, 18", tanks, cwt.	1.05-.1.05	1.05-.1.05	1.00-1.10
Nitric, 36", carboys, lb.	.05-.05½	.05-.05½	.05-.05½
Oleum, tanks, wks., ton	18.50-20.00	18.50-20.00	18.50-20.00
Oxalic, crystals, bbl., lb.	.10½-.12	.10½-.12	.11½-.12½
Phosphoric, tech., c'ys., lb.	.09-.10	.09-.10	.09-.10
Sulphuric, 60", tanks, ton	13.00-13.00	13.00-13.00	11.00-11.50
Sulphuric, 66", tanks, ton	16.50-16.50	16.50-16.50	15.50-16.00
Tannic, tech., bbl., lb.	.26-.30	.26-.30	.20-.30
Tartaric, powd., bbl., lb.	.24½-.25½	.24½-.25½	.24-.25
Tungstic, bbl., lb.	2.75-2.75	2.75-2.75	2.50-2.75
Alcohol, Amyl	.123-	.123-	.143-
From Pentane, tanks, lb.	.08½-	.08½-	.08½-
Alcohol, Butyl, tanks, lb.	.08½-	.08½-	.08½-
Alcohol, Ethyl, 190p'f., bbl., gal.	4.14-	4.14-	4.27½-
Denatured, 190 proof			
No. 1 special, dr., gal wks.	.34-	.32-	.34-
Alum, ammonia, lump, bbl., lb.	.03-.04	.03-.04	.03-.04
Potash, lump, bbl., lb.	.03½-.04	.03½-.04	.03-.04
Aluminum sulphate, com bags cwt.	1.35-1.50	1.35-1.50	1.35-1.50
Iron free, bg., cwt.	2.00-2.25	2.00-2.25	2.00-2.25
Aqua ammonia, 26", drums, lb.	.02½-.03	.02½-.03	.02½-.03
tanks, lb.	.02½-.02½	.02½-.02½	.02½-.02½
Ammonia, anhydrous, cyl., lb.	.16-	.15½-.16	.15½-.16
tanks, lb.	.04½-	.04½-	.04½-
Ammonium carbonate, powd tech., caaks, lb.	.08-.12	.08-.12	.08-.12
Sulphate, wks., cwt.	1.425-	1.425-	1.25-
Amylacetate tech., tanks, lb.	.11½-.12	.11½-.12	.12-
Antimony Oxide, bbl., lb.	.15½-.16	.16-16½	.13-14
Arsenic, white, powd., bbl., lb.	.03-.03½	.03-.03½	.03½-.04
Red, powd., kegs, lb.	.15½-.16	.15½-.16	.15½-.16
Barium carbonate, bbl., ton	52.50-57.50	52.50-57.50	56.50-58.00
Chloride, bbl., ton	72.00-74.00	72.00-74.00	72.00-74.00
Nitrate, caek, lb.	.07-.08	.07-.08	.08½-.09
Blanc fixe, dry, bbl., lb.	.03½-.04	.03½-.04	.03½-.04
Bleaching powder, f. o. b., wks., drums, cwt.	2.00-2.10	2.00-2.10	2.00-2.10
Borax, gran., bags, ton	46.00-51.00	46.00-51.00	44.00-49.00
Bromine, cs., lb.	.36-.38	.36-.38	.36-.38
Calcium acetate, bags	2.25-.25	2.25-.25	2.10-.21
Arsenate, dr., lb.	.06½-.07	.06½-.07	.06-.07
Carbide drums, lb.	.05-.06	.05-.06	.05-.06
Chloride, fused, dr., del., ton	20.00-33.00	20.00-33.00	20.00-33.00
flake, dr., del., ton	22.00-35.00	22.00-35.00	22.00-35.00
Phosphate, bbl., lb.	.07½-.08	.07½-.08	.07½-.08
Carbon bisulphide, drums, lb.	.05-.06	.05-.06	.05½-.06
Tetrachloride drums, lb.	.05½-.08½	.05½-.06	.05½-.06
Chlorine, liquid, tanks, wks., lb.	2.15-.215	2.15-.215	2.15-.215
Cylinders	.05½-.06	.05½-.06	.05½-.06
Cobalt oxide, caak, lb.	1.67-1.70	1.67-1.70	1.41-1.51
Copperas, bgs., f.o.b., wks., ton	15.00-16.00	15.00-16.00	15.00-16.00
Copper carbonate, bbl., lb.	.10½-.19½	.10½-.19	.11½-.16
Sulphate, bbl., cwt.	5.15-5.40	5.15-5.40	4.00-4.25
Creosol of tartar, bbl., lb.	.18½-.19	.18½-.19	.16½-.17
Diethylene glycol, dr., lb.	.22-.23	.22-.23	.16½-.20½
Epom salt, dom., tech., bbl., cwt.	1.80-2.00	1.80-2.00	1.80-2.00
Ethyl acetate, drums, lb.	.07½-.07½	.07½-.07½	.07-.07
Formaldehyde, 40%, bbl., lb.	.05½-.06½	.05½-.06½	.06-.07
Furfural, dr., lb.	.10-.17½	.10-.17½	.10-.17½
Fuel oil, ref. drums, lb.	.16-.18	.16-.18	.16-.18
Glauber salt, bags, cwt.	.95-1.00	.95-1.00	.85-1.00
Glycerine, c.p., drums, extra, lb.	.23½-	.23½-	.14½-.15
Lead:			
White, basic carbonate, dry caaks, lb.	.07½-	.07½-	.06½-
White, basic sulphate, sk., lb.	.07½-	.07½-	.06-
Red, dry, sk., lb.	.09-	.08½-	.07-
Lead acetate, white crys., bbl., lb.	.13½-.14	.13½-.14	.10½-.11
Lead arsenate, powd., bbl., lb.	.11½-.12	.11½-.12	.09-.10
Lime, chem., bulk, ton	8.50-8.50	8.50-8.50	8.50-8.50
Litharge, powd., sk., lb.	.08½-	.07½-	.06-
Lithophone, bags, lb.	.04½-.04½	.04½-.04½	.04½-.05
Magnesium carb., tech., bags, lb.	.06-.06½	.06-.06½	.06-.06½

The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to August 13

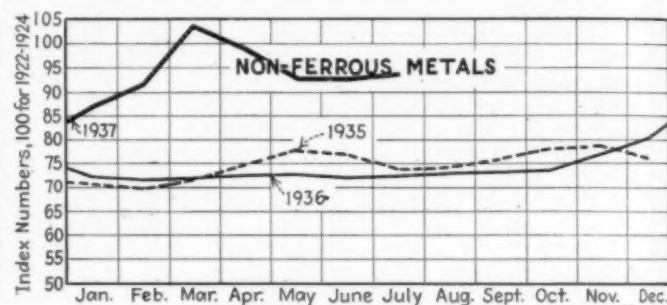
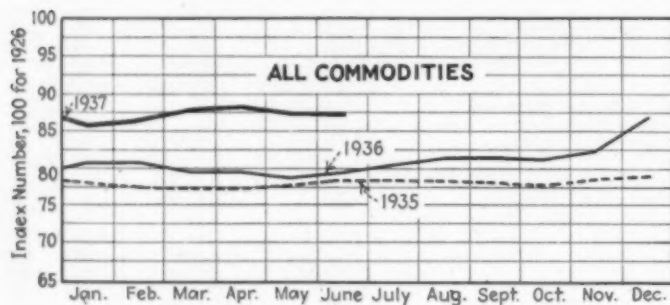
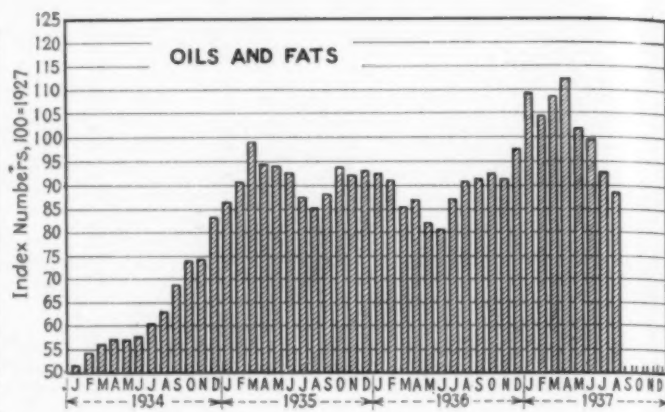
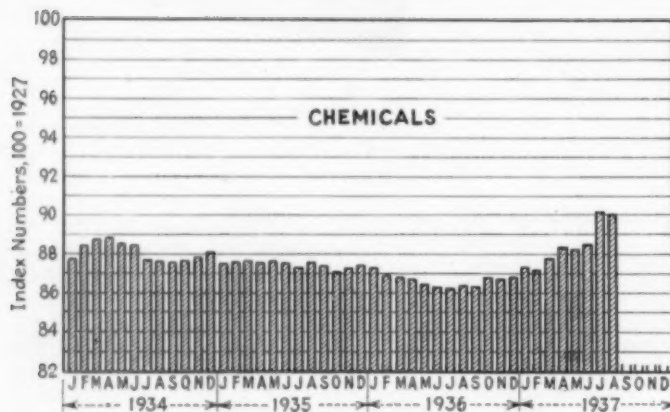
Current
PRICES

	Current Price	Last Month	Last Year
Methanol, 95%, tanks, gal.	.31-	.31-	.33-
97%, tanks, gal.	.32-	.32-	.34-
Synthetic, tanks, gal.	.33-	.33-	.35½-
Nickel salt, double, bbl., lb.	.13-.13½	.13-.13½	.13-.13½
Orange mineral, ca., lb.	.12-	.11½-	.10-
Phosphorus, red, cases, lb.	.40-.42	.40-.42	.44-.45
Yellow, cases, lb.	.24-.30	.24-.30	.28-.32
Potassium bichromate, caaks, lb.	.08½-.09	.08½-.09	.08½-.09
Carbonate, 80-85%, calc. ca., lb.	.06½-	.06½-	.07-.07½
Chlorate, powd., lb.	.09½-	.09½-.09	.08-.08½
Hydroxide (caustic potash) dr., lb.	.07-.07½	.07-.07½	.06½-.06½
Muriate, 80% bgs., ton	23.00-	23.00-	22.00-
Nitrate, bbl., lb.	.05½-.06	.05½-.06	.05½-.06
Permanganate, drums, lb.	.18½-.19	.18½-.19	.18½-.19
Prussiate, yellow, caaks, lb.	.15-.16	.15-.16	.18-.19
Sal ammoniac, white, caaks, lb.	.05-.05½	.05-.05½	.04½-.05
Salsoda, bbl., cwt.	1.00-1.05	1.00-1.05	1.00-1.05
Salt cake, bulk, ton	13.00-15.00	13.00-15.00	13.00-15.00
Soda ash, light, 58%, bags, contract, cwt.	1.23-	1.23-	1.23-
Dense, bags, cwt.	1.25-	1.25-	1.25-
Soda, caustic, 76%, solid, drums, contract, cwt.	2.60-3.00	2.60-3.00	2.60-3.00
Acetate, works, bbl., lb.	.04½-.05	.04½-.05	.04½-.05
Bicarbonate, bbl., cwt.	1.75-2.00	1.75-2.00	1.85-2.00
Bichromate, caaks, lb.	.06½-.07	.06½-.07	.06½-.07
Bisulphate, bulk, ton	15.00-16.00	15.00-16.00	15.00-16.00
Bisulphite, bbl., lb.	.03½-.04	.03½-.04	.03-.04
Chlorate, kegs, lb.	.06½-.06½	.06½-.06½	.06½-.06½
Chloride, tech., ton	12.00-14.75	12.00-14.75	12.00-14.75
Cyanide, caes, dom., lb.	.16½-.17	.16½-.17	.15½-.16
Fluoride, bbl., lb.	.07½-.08	.07½-.08	.07½-.08
Hyposulphite, bbl., cwt.	2.40-2.50	2.40-2.50	2.40-2.50
Metasilicate, bbl., cwt.	2.15-3.15	2.15-3.15	2.90-3.00
Nitrate, bags, cwt.	1.45-	1.425-	1.325-
Nitrite, caaks, lb.	.07-.08	.07-.08	.07½-.08
Phosphate, dibasic, bbl., lb.	1.70-	1.70-	.022-.024
Prussiate, yel. drums, lb.	.10-.11	.10-.11	.11½-.12
Silicate (40" dr.) wks., cwt.	.80-.85	.80-.85	.80-.85
Sulphide, fused, 60-62%, dr., lb.	.02½-.03½	.02½-.03	.02½-.03
Sulphite, cyrs., bbl., lb.	.02½-.02½	.02½-.02½	.02½-.02½
Sulphur, crude at mine, bulk, ton	18.00-	18.00-	18.00-
Chloride, dr., lb.	.03-.04	.03-.04	.03½-.04
Dioxide, cyl., lb.	.07-.08	.06½-.08	.07-.07½
Flour, bag, cwt.	1.60-3.00	1.60-3.00	1.60-3.00
Tin Oxide, bbl., lb.	.58-	.58-	.47-
Crysalis, bbl., lb.	.41½-	.40½-.34	.34-
Zinc chloride, gran., bbl., lb.	.05-.06	.05-.06	.05-.06
Carbonate, bbl., lb.	.14-.15	.14-.15	.09-.11
Cyanide, dr., lb.	.36-.38	.36-.38	.36-.38
Dust, bbl., lb.	.089-	.086-	.068-
Zinc oxide, lead free, bag., lb.	.06½-	.06½-	.05-
5% lead sulphate, bags, lb.	.06½-	.06½-	.04½-
Sulphate, bbl., cwt.	3.15-3.60	3.15-3.60	2.65-3.00

OILS AND FATS

	Current Price	Last Month	Last Year
Castor oil, No. 3, bbl., lb.	\$0.10½-\$0.11	\$0.10½-\$0.11	\$0.10-\$0.11
Chinawood oil, bbl., lb.	.12-	.12½-	.16-
Cocoonut oil, Ceylon, tanks, N. Y. lb.	.05½-	.05½-	.04½-
Corn oil crude, tanks (f.o.b. mill), lb.	.08-	.08-	.09½-
Cottonseed oil, crude (f.o.b. mill), tanks, lb.	.07-	.08-	.08½-
Linseed oil, raw car lots, bbl., lb.	.112-	.11-	.103-
Palm, caaks, lb.	.05½-	.05½-	.04½-
Peanut oil, crude, tanks (mill), lb.	.08-	.08-	.09-
Rapeseed oil, refined, bbl., gal.	.96-	.95-	.65-
Soya bean, tank, lb.	.07½-	.07½-	.08½-
Sulphur (olive foots), bbl., lb.	.11½-	.11½-	.08-
Cod, Newfoundland, bbl., gal.	.52-	.52-	.40-
Menhaden, light pressed, bbl., lb.	.083-	.09-	.072-
Crude, tanks (f.o.b. factory), gal.	.40-	.40-	.30-
Grease, yellow, loose, lb.	.07½-	.07½-	.05½-
Oleo stearine, lb.	.09½-	.09½-	.10-
Red oil, distilled, d.p. bbl., lb.	.11-	.11-	.09½-
Tallow extra, loose, lb.	.07½-	.08½-	.06-

CHEM. & MET.'S WEIGHTED PRICE INDEXES



COAL-TAR PRODUCTS

	Current Price	Last Month	Last Year
Alpha-naphthol, crude bbl., lb.	\$0.52-\$0.55	\$0.52-\$0.55	\$0.60-\$0.62
Alpha-naphthylamine, bbl., lb.	.32-.34	.32-.34	.32-.34
Aniline oil, drums, extra, lb.	.15-.16	.15-.16	.14-.15
Aniline salts, bbl., lb.	.22-.24	.22-.24	.24-.25
Benzaldehyde, U.S.P., dr., lb.	.65-.95	.65-.95	1.10-1.25
Benzidine base, bbl., lb.	.70-.75	.70-.75	.65-.67
Benzoic acid, U.S.P., kg., lb.	.52-.54	.52-.54	.48-.52
Benzyl chloride, tech., dr., lb.	.40-.42	.40-.42	.30-.35
Benzol, 90%, tanks, works, gal.	.16-.18	.16-.18	.18-.20
Beta-naphthol, tech., drums, lb.	.23-.24	.23-.24	.24-.27
Cresol, U.S.P., dr., lb.	.12-.13	.12-.13	.11-.11½
Cresylic acid, 99%, dr., wks., gal.	.92-1.00	.92-1.00	.68-.70
Diethylamine, dr., lb.	.50-.55	.50-.55	.55-.58
Dinitrophenol, bbl., lb.	.23-.25	.23-.25	.29-.30
Dinitrotoluene, bbl., lb.	.15-.16	.15-.16	.16-.17
Dip oil, 25%, dr., gal.	.23-.25	.23-.25	.23-.25
Diphenylamine, bbl., lb.	.32-.36	.32-.36	.38-.40
H-acid, bbl., lb.	.30-.55	.30-.55	.65-.70
Naphthalene, flake, bbl., lb.	.07½-.07½	.07½-.07½	.07-.08
Nitrobenzene, dr., lb.	.08-.09	.08-.09	.08½-.10
Para-nitraniline, bbl., lb.	.45-.47	.45-.47	.51-.55
Phenol, U.S.P., drums, lb.	.13½-.14	.13½-.14	.14½-.15
Picric acid, bbl., lb.	.35-.40	.35-.40	.30-.40
Pyridine, dr., gal.	1.55-1.60	1.55-1.60	1.10-1.15
Resorcinol, tech., kg., lb.	.75-.80	.75-.80	.65-.70
Salicylic acid, tech., bbl., lb.	.34-.40	.34-.40	.40-.42
Solvent naphtha, w.w., tanks, gal.	.30-.30	.30-.30	.26-.26
Tolidine, bbl., lb.	.88-.90	.88-.90	.88-.90
Toluene, tanks, works, gal.	.35-.35	.35-.35	.30-.30
Xylene, com, tanks, gal.	.35-.35	.35-.35	.30-.30

MISCELLANEOUS

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton.	\$22.00-\$25.00	\$22.00-\$25.00	\$22.00-\$25.00
Casein, tech., bbl., lb.	.13-.14	.13-.14	.15½-.17
China clay, dom., f.o.b. mine, ton.	8.00-20.00	8.00-20.00	8.00-20.00
Dry colors:			
Carbon gas, black (wks.), lb.	.04-.20	.04-.20	.04-.20
Prussian blue, bbl., lb.	.37-.38	.37-.38	.37-.38
Ultramarine blue, bbl., lb.	.10-.26	.10-.26	.10-.26
Chromes green, bbl., lb.	.21-.37	.21-.37	.21-.37
Carmines red, tins, lb.	4.00-4.40	4.00-4.40	4.00-4.40
Fara toner, lb.	.75-.80	.75-.80	.80-.85
Vermilion, English, bbl., lb.	1.75-1.80	1.80-1.90	1.59-1.60
Chromes yellow, C. P., bbl., lb.	.14½-.15½	.14½-.15½	.12-.14
Feldspar, No. 1 (f.o.b. N.C.), ton.	6.50-7.50	6.50-7.50	6.50-7.50
Graphite, Ceylon, lump, bbl., lb.	.06-.06½	.06-.06½	.07-.08
Gum copal Congo, bags, lb.	.08-.30	.08-.30	.08-.30
Manila, bags, lb.	.08½-.14	.08½-.14	.08½-.14
Damar, Batavia, cases, lb.	.16-.24	.15½-.23	.15½-.16
Kauri cases, lb.	.18½-.60	.17½-.60	.20-.25
Kieselguhr (f.o.b. N. Y.), ton.	50.00-55.00	50.00-55.00	50.00-55.00
Magnesite, calc, ton.	50.00-55.00	50.00-55.00	50.00-55.00
Pumice stone, lump, bbl., lb.	.05-.07	.05-.08	.05-.07
Imported, cauka, lb.	.03-.40	.03-.40	.03-.35
Rosin, H., bbl.	8.85-.95	9.35-.95	7.35-.95
Turpentine, gal.	.36-.36	.39½-.39½	.44-.44
Shellac, orange, fine, bags, lb.	.23-.23	.23-.23	.25-.25
Bleached, bonedry, bags, lb.	.12½-.12½	.17½-.17½	.18-.18
T. N. Bags, lb.	.12½-.12½	.12½-.12½	.14½-.14½
Soapstone (f.o.b. Vt.), bags, ton.	10.00-12.00	10.00-12.00	10.00-12.00
Talc, 200 mesh (f.o.b. Vt.), ton.	8.00-8.50	8.00-8.50	8.00-8.50
300 mesh (f.o.b. Ga.), ton.	7.50-10.00	7.50-10.00	7.50-11.00
225 mesh (f.o.b. N. Y.), ton.	13.75-13.75	13.75-13.75	13.75-13.75

INDUSTRIAL NOTES

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., has appointed H. F. Boe commercial manager. Mr. Boe will have two headquarters, one in the Union Bank Bldg., Pittsburgh, the other at 150 Broadway, New York.

BUFFALO SCALE CO., Buffalo, N. Y., has appointed E. J. Kelly, 2010 Locust St., St. Louis, sales representative for Missouri and southern Illinois.

GLASCOTE PRODUCTS INC., Cleveland, has appointed Charles W. Glaser sales representative for the metropolitan New York territory with headquarters at 307 Fifth Ave., New York.

THE STEIN-BRILL CORP., New York, has changed its name to the Brill Equipment Corp. There will be no change in management. A branch office and warehouse has been opened in the Mart Bldg., St. Louis.

JOSEPH T. RYERSON & SON, INC., Chicago, has elected Everett D. Graff president. Edward L. Ryerson, Jr., is chairman of the board.

FULLER COMPANY, Catawauqua, Pa., has placed Howard S. Sayre in charge of its Chicago office in the Marquette Bldg.

THE NEVILLE CO., Pittsburgh, since July 1 has been represented in the New York territory by Calo & Lydon, 90 West St.

Where Plants Are Being Built in Process Industries

	Current Projects		Cumulative 1937	
	Proposed Work	Contracts	Proposed Work	Contracts
New England.....	\$40,000	\$275,000	\$945,000	\$1,730,000
Middle Atlantic.....	1,540,000	1,730,000	13,832,000	12,881,000
South.....	13,540,000	500,000	24,045,000	25,363,000
Middle West.....	1,060,000	272,000	12,498,000	19,067,000
West of Mississippi.....	5,180,000	77,000	14,172,000	6,858,000
Far West.....	470,000	5,100,000	3,755,000	8,978,000
Canada.....	8,240,000	690,000	18,765,000	1,551,000
Total.....	\$30,110,000	\$8,644,000	\$88,012,000	\$76,428,000

PROPOSED WORK

Chemical Factory—Kentucky Chemical Manufacturing Co., 410 East 10th St., Covington, Ky., plans to construct 6 1-story buildings at its plant including factory building, office and garage. Hillsmith & Co., Chamber of Commerce Bldg., Dayton, O., Engr. Estimated cost \$40,000.

Chemical Factory—Merritt Chemical Co., Ltd., c/o Joseph C. Savage, K.C., 215 St. James St., W., Montreal, Que., Can., plans to construct a factory for the manufacture of dyestuffs, soaps, cosmetics, etc. Estimated cost \$49,000.

Factory—Acme Shellac Products Corp., 48-10 30th St., Long Island City, N. Y., contemplates repairing its plant recently damaged by fire. Estimated cost \$40,000.

Factory—The Pepsodent Co. of Canada, Ltd., 191 George St., Toronto, Ont., Can., plans to construct a factory at Vancouver, B. C., Can. Estimated cost \$50,000.

Factory—Washington Co., North Grafton, Mass., manufacturer of emery products, contemplates rebuilding its factory recently destroyed by fire. Estimated cost including equipment \$40,000.

Gas Plant—City of Jamestown, Samuel A. Carlson, Mayor, Jamestown, N. Y., plans to construct a municipal gas plant and distribution system. Project will be submitted to voters at special election soon. L. L. Graham, City Engr. Estimated cost \$1,500,000.

Laboratory—Case School of Applied Science, Euclid Ave., Cleveland, O., plans to construct Chemical Engineering and Electrical Engineering Laboratories on the Campus. Estimated cost between \$400,000 and \$600,000 respectively.

Liquor Rectifying Plant—Gordon Neill Co., 91 Seventh Ave., New York, N. Y., contemplates alterations to its liquor rectifying plant at 120 Sherman Ave., Jersey City, N. J. Estimated cost including equipment \$40,000.

Fibre Mill—Meyercord Compound Lumber Co., Mobile, Ala., plans to construct a mill to manufacture fibre wood at Frascatti, Ala. Estimated cost \$150,000.

Plywood Mill—Anacortes Plywood Co., J. J. Lucas, Pres., Anacortes, Wash., contemplates the construction of a plywood mill. Estimated cost \$400,000.

Paper Mill—Beckett Paper Co., Hamilton, O., plans to construct three additions to its mill on Buckeye St., Hamilton. Estimated cost \$60,000.

Pulp and Paper Mill—Fernandina Pulp & Paper Co., Fernandina, Fla., organized by Pacific coast interests associated with Rainier Pulp & Paper Co., Grays Harbor Pulp & Paper Co. and Olympia Forest Products Co., plans to construct a pulp and paper mill on a 175 acre site on the Amelia River for the manufacture of wood pulp from Southern pine. Estimated cost \$6,000,000.

Pulp Mill—Gaylord Container Corp., Bogalusa, La., plans to enlarge its paper pulp and box plant including a caustic fluid system, diffuser system for washing pulp and lime burner. Estimated cost \$400,000.

Pulp Mill—Riegel Paper Corp., 342 Madison Ave., New York, N. Y., has purchased a site near Wilmington, N. C., and plans to construct a wood pulp plant to have a daily capacity of 125 tons. Project will cost several million dollars.

Sulphite Mill—Frank L. Buckley, Vancouver, B. C., Can., plans to construct a bleached sulphite mill to have a daily capacity of 250 tons at Prince Rupert, B. C. Estimated cost \$8,000,000.

Refinery—Bay Petroleum Corp., c/o Charles U. Bay, Bridgeport, Conn., and Cheyenne, Wyo., has acquired the former Dieckel Oil Refinery at Wichita, Kan., and plans to double the capacity. Estimated cost \$40,000.

Refinery—Bramcoe Oil & Gas Co., W. E. Brown, Pres., P. O. Box 945, Tyler, Tex., plans to construct a 1 story plant near Lisbon, La., for the manufacture of cashing head gasoline. Estimated cost \$40,000.

Refinery—British Pacific Oils Ltd., 800 Hall Bldg., Vancouver, B. C., Can., plans to develop its properties here involving an expenditure of \$100,000.

Refinery—Great National Oil Corp., J. D. Blanton, Secy.-Treas., P. O. Box 992, Shreveport, La., plans to construct a 1,000 bbl. capacity gasoline manufacturing plant; also additional unit at gasoline absorption plant in Caddo Parish, Shreveport, La. J. W. Coast, Tulsa, Engr. Estimated cost \$200,000.

Refinery—M. M. McCallen Refining Co., 17th St., Huntington Beach, Calif., plans to enlarge its refinery and construct storage tanks. Estimated cost \$30,000.

Refinery—Shell Petroleum Corp., Norco, La., plans to construct additions to its refinery here. Estimated cost \$750,000.

Refinery—Skelley Oil Co., J. W. Varden, Supt., Tulsa, Okla., plans to construct a 5,000 gal. per day natural gasoline absorption plant in the Eunice oil fields, Eunice, N. M., and is in the market for nine 230 hp. Bessemer type gas engines. Estimated cost \$100,000.

Copper Refinery—Canadian Copper Refineries, Ltd., Ducher St., Montreal East, Que., Can., plans to construct an addition to their refinery. Estimated cost \$50,000.

Smelter—Aluminum Ore Co., 3300 Missouri Ave., St. Louis, Mo., has acquired a site at Mobile, Ala., and plans to construct an aluminum ore-bauxite smelter. Estimated cost \$4,000,000.

Smelter—Nevada Consolidated Copper Co., 120 Bway., New York, N. Y., subsidiary of Kennecott Copper Co., plans to construct a smelter at Hurley, N. M. Estimated cost \$5,000,000.

Warehouse—Associated Oil Co., Associated Oil Bldg., San Francisco, Calif., is having plans prepared for a drum building and warehouse. Estimated cost \$40,000.

CONTRACTS AWARDED

Cement Silos—Canada Cement Co., 610 Cathcart St., Montreal, Que., Can., has awarded the contract for two cement silos at Chatham, Ont., Can., to E. G. N. Cane & Co., 620 Cathcart St., Montreal. Estimated cost \$50,000.

Cement Silos—Lone Star Cement Co., c/o L. J. Wheeler, Supt., Houston, Tex., has awarded the contract for cement silos to Nicholson & Co., Houston Ship Channel, Houston. Estimated cost \$77,000.

Distillery—Hunter Baltimore Pure Rye Distillery, Gwynnbrook, Md., has awarded the contract for a 4 story blending building and a 2 and 3 story bottling building to G. Walter Torell, Eutaw and Monument Sts., Baltimore. Estimated cost \$200,000.

Laboratory—Agfa Ansco Corp., 29 Charles St., Binghamton, N. Y., has awarded the contract for a laboratory to Winton-Abbott Corp., 1225 South Ave., Plainfield. Estimated cost \$200,000.

Lacquer Factory—American Lacquer Co., 1127 West Sixth St., Cincinnati, O., has awarded the contract for a factory to William Leuvelink & Son, 3995 Woodford Rd., Cincinnati. Estimated cost \$40,000.

Factory—American Optical Co., Mechanic St., Southbridge, Mass., has awarded the contract for an addition to its plant to H. U. Hall Sons, Inc., 9 Franklin St., Southbridge. Estimated cost \$125,000.

Factory—Chicago Rawhide Manufacturing Co., 1301 North Elston Ave., Chicago, Ill., has awarded the contract for a factory to Hoeffer & Co., 205 West Wacker Dr., Chicago. Estimated cost \$40,000.

Factory—National Aniline & Chemical Co., Abbott Rd., Buffalo, N. Y., has awarded the contract for Factory Building No. 75 to Frank C. Huber Co., 860 Hertel Ave., Buffalo.

Glass Factory—Pitt Corning Glass Co., Pittsburgh, Pa., has awarded the contract for a 80x400 ft. factory building to H. K. Ferguson Co., Hanna Bldg., Cleveland, O.

Laboratory—Gunnery School, Inc., Washington, Conn., has awarded the contract for the construction of a laboratory to Harry Maring, Jr., 536 Lindley St., Bridgeport, Conn. \$150,000.

Laboratory—International Nickel Co. of Canada, Ltd., 25 King St., W., Toronto, Ont., has awarded the contract for a 1 story, 34x75 ft. laboratory building to Schultz Construction, Ltd., 47 Albion St., Brantford, Ont., Can. at Port Colburn, Ont.

Pulp Mill—British Columbia Pulp & Paper Co., 560 West Hastings Co., Vancouver, B. C., Can., has awarded the contract for a 2 story, 65x110 ft. bleach house, tanks, chests, etc., at Woodfibre, B. C., to Dominion Construction Co., 509 Richards St., Vancouver. Estimated cost including equipment \$600,000.

Paper Mill—Scott Paper Co., Market St., Chester, Pa., has awarded contract for foundation for new mill to David M. Hunt, 1700 Sansom St., Philadelphia, Pa. Superstructure will be done by day labor. Estimated cost \$1,250,000.

Polymerization Plant—Standard Oil Co. of Louisiana, Baton Rouge, La., has awarded the contract for the construction of a non-selective polymerization plant to Arthur G. McKee Co., 2422 Euclid Ave., Cleveland, O. Estimated cost \$500,000.

Polymerization Plant—Tide Water Associated Oil Co., Avon, Calif., has awarded the contract for the construction of a polymerization plant to have a capacity of 5,000,000 cu. ft. to Alco Products Co., Dunkirk, N. Y.

Refinery—General Petroleum Co., Higgins Bldg., Los Angeles, Calif., has awarded separate contracts for the construction of an oil refinery, storage tanks, towers, etc., at Torrance, Calif. Estimated cost \$600,000.

Refinery—Richfield Oil Co., 555 South Flower St., Los Angeles, Calif., has awarded the contract for equipment for oil refinery at Watson, Calif., to G. F. Braun & Co., 1000 South Fremont Ave., Alhambra. Estimated cost \$4,000,000.

Refinery—White Star Refining Co., 903 West Grand Blvd., Detroit, Mich., has awarded the contract for an addition to its refinery to W. S. Pocock Co., 1726 Seward St., Detroit. Estimated cost \$50,000.

Rubber Factory—Premier Rubber Manufacturing Co., Edmund St., Dayton, O., has awarded the contract for a 1 story, 85x120 ft. addition to its factory to B. G. Davis Co., 1530 East First St., Dayton. Estimated cost \$40,000.

Rubber Factory—General Asbestos & Rubber Co., 61 Willett St., Passaic, N. J., and North Charleston, S. C., division of Raybestos-Manhattan Co., has awarded the contract for the construction of a rubber roller factory to Charleston Constructors, Inc., Adgers Wharf, Charleston. Estimated cost \$42,000.

Warehouse—Chape Stevens Paper Co., 1915 West Fort St., Detroit, Mich., has awarded the contract for the construction of a warehouse to Alder Contracting Co., 17041 Hamilton Ave., Detroit, Mich. Estimated cost \$60,000.

New
CONSTRUCTION

TARIFF COMMISSION MAKES SURVEY OF SODIUM SULPHATE

THE United States Tariff Commission has issued a very comprehensive report on domestic production, consumption, and foreign trade in sodium sulphate. The survey includes glauber salt and anhydrous sodium sulphate but, because of its greater importance, salt cake is given major attention.

The survey found that more than four-fifths of domestic salt cake is produced in conjunction with other chemicals, chiefly hydrochloric acid, in the North Atlantic and North Central States. The remainder is obtained from natural deposits in the Western States.

Production of chemical salt cake in 1935 was 161,449 tons of which 119,280 tons was made as a coproduct of hydrochloric acid, 26,672 tons in conjunction with the manufacture of sodium bichromate, and 15,497 tons incidental to formic acid production and in other industrial processes involving the combination of sodium and sulphate radicals. Four concerns, making salt cake in conjunction with hydrochloric acid, accounted for about two-thirds of the total output of chemical salt cake in 1935.

In 1935 only two concerns, one operating in Texas and the other in California, were engaged in the production of salt cake from natural deposits. Total output of all forms of natural sodium sulphate in that year amounted to 38,706 tons. In former years, substantial quantities of salt cake were mined in Arizona and Nevada.

The present status of the salt cake industry may be summarized by stating consumption is increasing rapidly, domestic production is declining, and conversely imports are gaining in volume. The trend for consumption of salt cake is evident from the fact that in 1925, apparent consumption was 177,000 tons, in 1929, 284,000 tons, and in 1935, 307,000 tons. This increase is due to the expanding demand for salt cake in the sulphate pulp industry. From 1927 to 1935 domestic production of sulphate pulp increased more than 100 per cent and the quantity of salt cake used in that industry increased at the same rate. A breakdown of salt cake consumption in 1927 and 1935 shows the following: sulphate pulp, 106,000 tons and 216,775 tons; heavy chemicals, 97,000 tons and 31,262 tons; glass, 42,600 tons and 31,325 tons.

The drop in domestic production of salt cake is due to changes in the method of producing hydrochloric acid. When the greater part of this acid was made by treating niter cake with salt there was a yield of nearly four and one-half

tons of salt cake to every ton of 100 per cent acid. At present about 80 per cent of domestic hydrochloric acid is made from sulphuric acid and the yield of salt cake is about one-half that where niter cake is used. Furthermore, in 1935 about 17 per cent of the hydrochloric acid output came from the chlorination of organic products with no attendant yield of salt cake. Synthetic production of acid also amounted to 4,753 tons in 1935 or about 5 per cent of the total.

Domestic production of natural salt cake has been curtailed partly because of high freight rates to consuming markets and partly because of the low prices quoted for the imported material.

Practically all the salt cake imported is used in the sulphate pulp industry, principally in Southern and Pacific

Coast States where many of the mills are located near tidewater. In 1935, 70 per cent of the salt cake used in the southern pulp industry was imported and in the Pacific Coast area the proportion was 30 per cent.

The weighted average cost per ton of transporting domestic salt cake in 1935 was as follows: natural—to southern markets east of the Mississippi, \$11; west of the Mississippi, \$7.81; to Pacific coast markets, \$5.94. Chemical—to southern markets east of the Mississippi, \$3.25; west of the Mississippi, \$3.45; Great Lakes district, \$4.35; Pacific coast, \$6.40. For imported cake, transportation costs were \$5.83, east of the Mississippi; \$7.49 west of the Mississippi; and \$5.98 to the Pacific coast. The average delivered cost of imported cake in the east-Mississippi district was \$13.17 a ton compared with \$14.37 for domestic. Average delivered cost of imported cake to the west-Mississippi market was \$15.39 compared with \$14.77 for domestic. Delivered prices in Pacific coast markets were \$14.43 for imported and \$12.69 for domestic.

Domestic Consumption of Salt Cake, Glauber Salt, and Anhydrous Sodium Sulphate By Industries in 1935

Consuming Industries	Quantity in Short Tons			Per Cent of Total		
	Salt Cake	Glauber Salt	Anhydrous Sodium Sulphate	Salt Cake	Glauber Salt	Anhydrous Sodium Sulphate
Sulphate Pulp.....	216,775	.....	.....	73.2	.....	.....
Glass.....	31,325	.....	2,398	10.6	.....	5.1
Heavy Chemicals.....	31,262	.....	738	10.6	.....	1.6
Textiles.....	.....	24,920	22,959	.....	59.6	48.7
Coal-Tar Dyes.....	.....	43	12,074	.....	0.1	25.6
Medicinals.....	.....	2,799	192	.....	6.7	0.4
Tanning.....	.....	973	576	.....	2.3	1.2
Soap.....	.....	8	81	.....	(1)	0.2
Other.....	16,649 ¹	13,098 ²	8,124 ²	5.6	31.3	17.2
	296,011	41,841	47,142	100.0	100.0	100.0

¹ Less than one-tenth of one per cent.

² Includes sales to jobbers and brokers, a large part of which went to the industries specified above.

Source: Data obtained by the Tariff Commission from producers and importers through questionnaires.

Domestic Production of and Foreign Trade in Sodium Sulphate

	Production ¹ Short Tons	Imports Short Tons	Exports ² Short Tons	Apparent Consumption Short Tons	Per Cent of Apparent Consumption Furnished by Imports
Salt Cake					
1925.....	199,233	1,913	23,955	177,160	1.1
1927.....	231,645	11,172	23,888	218,855	5.1
1929.....	214,152	91,634	21,308	284,478	32.2
1931.....	151,909	72,747	3,634	221,022	32.9
1933.....	189,687	99,269	799	288,157	34.4
1935.....	200,155	110,379	3,256	307,278	35.9
1936.....	³	151,421	4,601	⁴	⁵
Glauber Salt					
1925.....	57,622	6,682	273	64,031	10.4
1927.....	53,420	3,145	62	56,503	5.6
1929.....	61,953	1,161	32	63,082	1.8
1931.....	45,624	924	52	46,496	2.0
1933.....	39,804	629	47	40,336	1.6
1935.....	39,961	551	121	40,391	1.4
1936.....	³	576	124	⁴	⁵
Anhydrous Sodium Sulphate					
1925.....	2,100	136	⁶	2,236	6.1
1927.....	2,688	2,877	⁶	5,565	51.7
1929.....	⁷	5,552	⁶	⁸	⁹
1931.....	7,609	10,315	⁶	17,924	57.5
1933.....	15,660	10,371	⁶	26,031	39.8
1935.....	23,609	5,788	⁶	29,397	19.7
1936.....	³	11,854	⁶	⁴	⁵

¹ A portion of salt cake production is used in the production of Glauber Salt and Anhydrous Sodium Sulphate.

² Data shown are Canadian imports of Salt Cake and Glauber Salt from the United States as reported in the Canadian Import Statistics. United States exports very little Salt Cake and Glauber Salt to countries other than Canada. ³ Not available. ⁴ Not available but known to be small.